Agriculture, Fires and Forests: Watching *(Monitoring) some of* the World's Resources

Chris Justice - University of Maryland
with contributions from various colleagues who actually do the work!

Fires in Indochina –April 6 2010 (NASA MODIS Aqua)

Take Home Message

Consistent long-term data records (CDR's) are as important for several applications of societal benefit as they are for

global change research

GROUP ON EARTH OBSERVATIONS

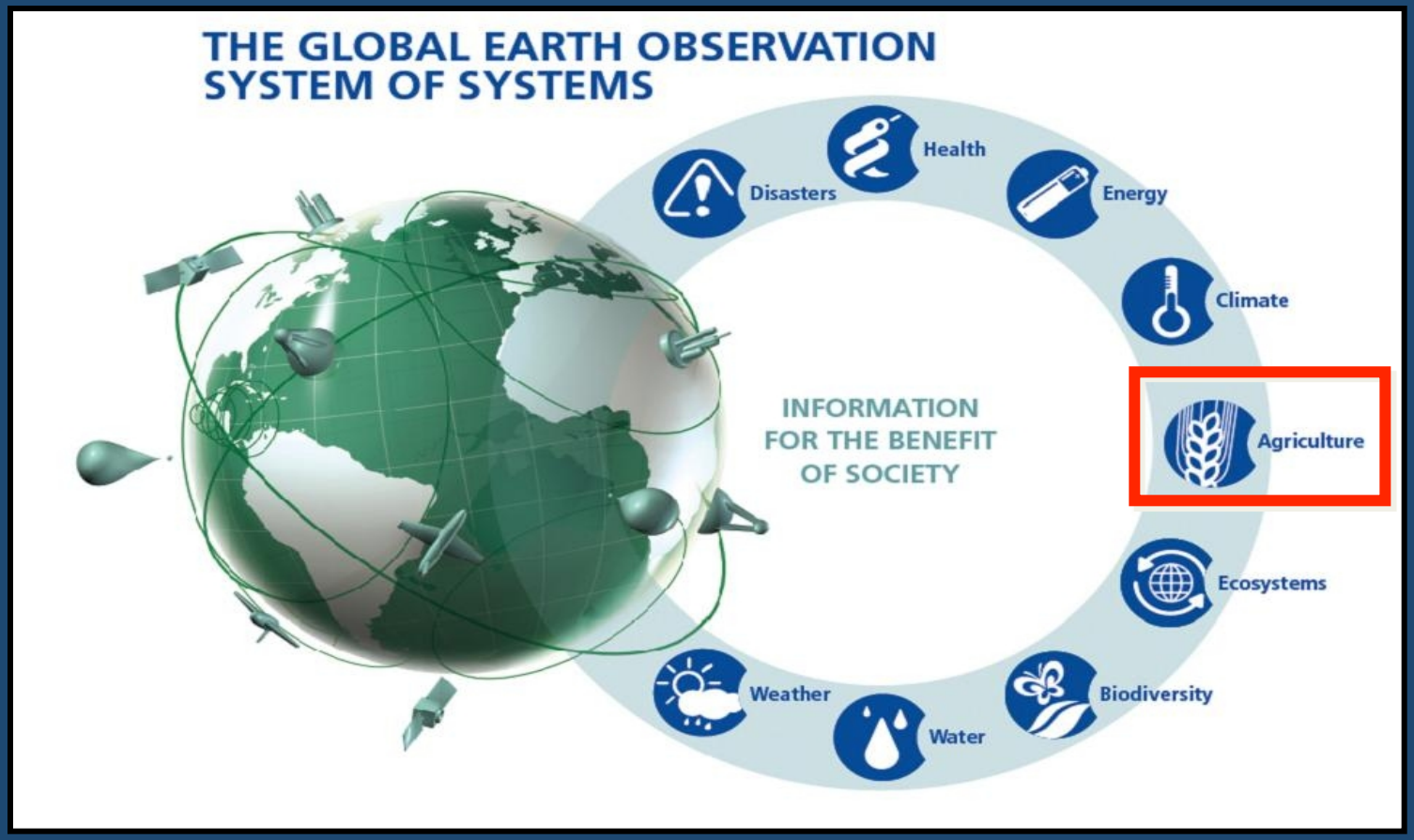
GEO the Group on Earth Observations

an Intergovernmental Organization with 90 Members and 67 Participating Organizations

U.S. Department of State, Washington DC
July 31, 2003

GEO is focused on societal benefit

Agriculture is one of the GEO societal benefit areas

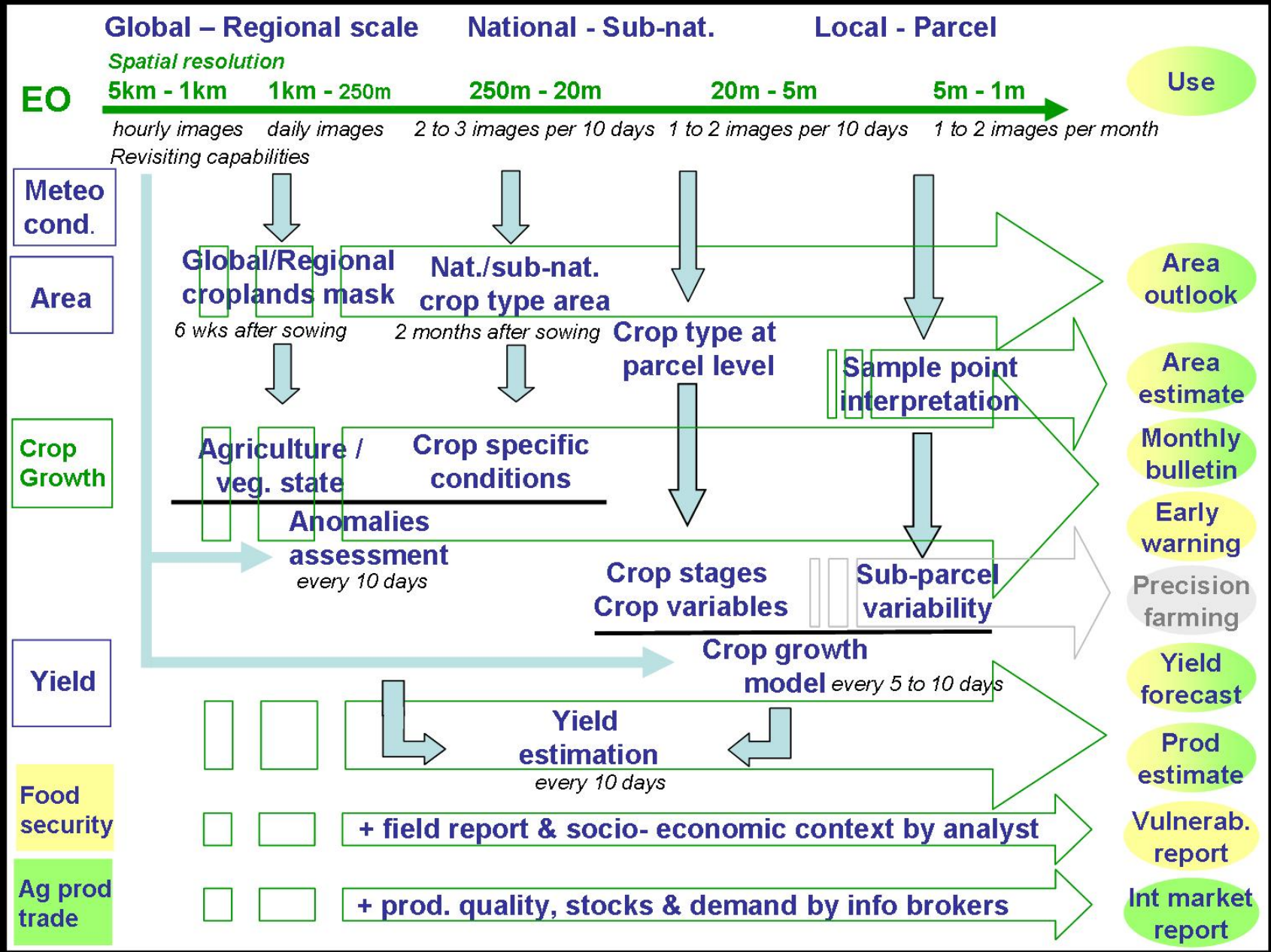


GROUP ON EARTH OBSERVATIONS

GEOGLAM
Global Agricultural Monitoring

Example Participants in the GEO Agriculture Community of Practice

From Earth Observations to Information



Identifying Information and Product Types

Information Products

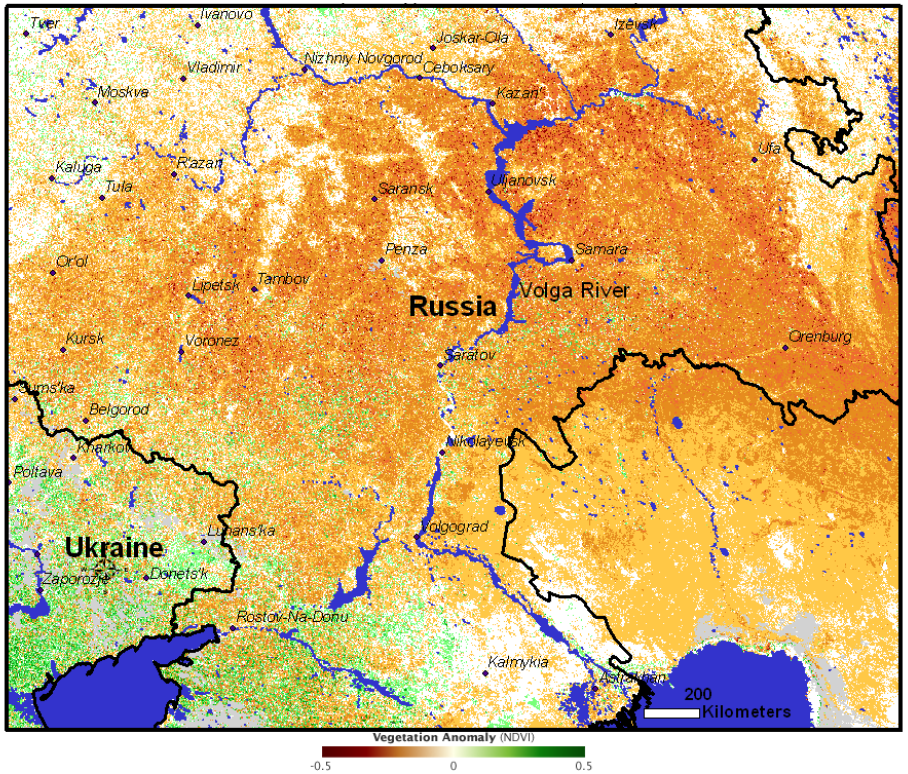
- Crop outlook / Early warning
- Area estimate
- Yield forecast
- Production estimate
- Food Sec/vulnerability report
- Statistics reports

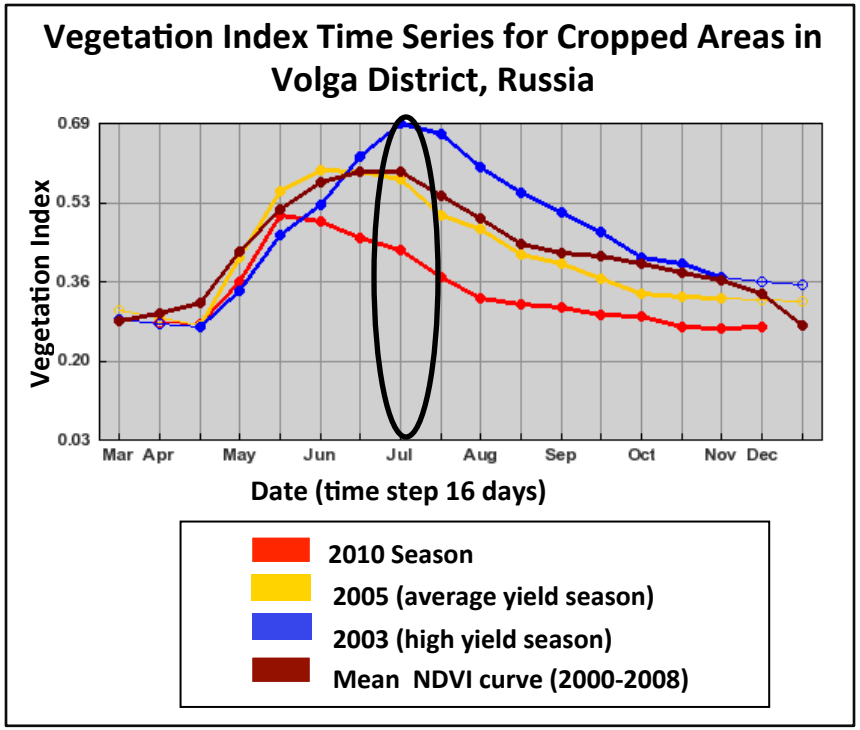
EO Data Products

- Cropland mask /Pasturelands
- Ag practices
- Crop condition indicators
- Crop type
- Biophysical variables
- Environmental variables (soil moisture)
- In-situ Weather

USDA Monitoring Drought Impact on Crops in Russia, 2010

Vegetation Anomaly Image, Volga District, Russia ; June 26- July11, 2010



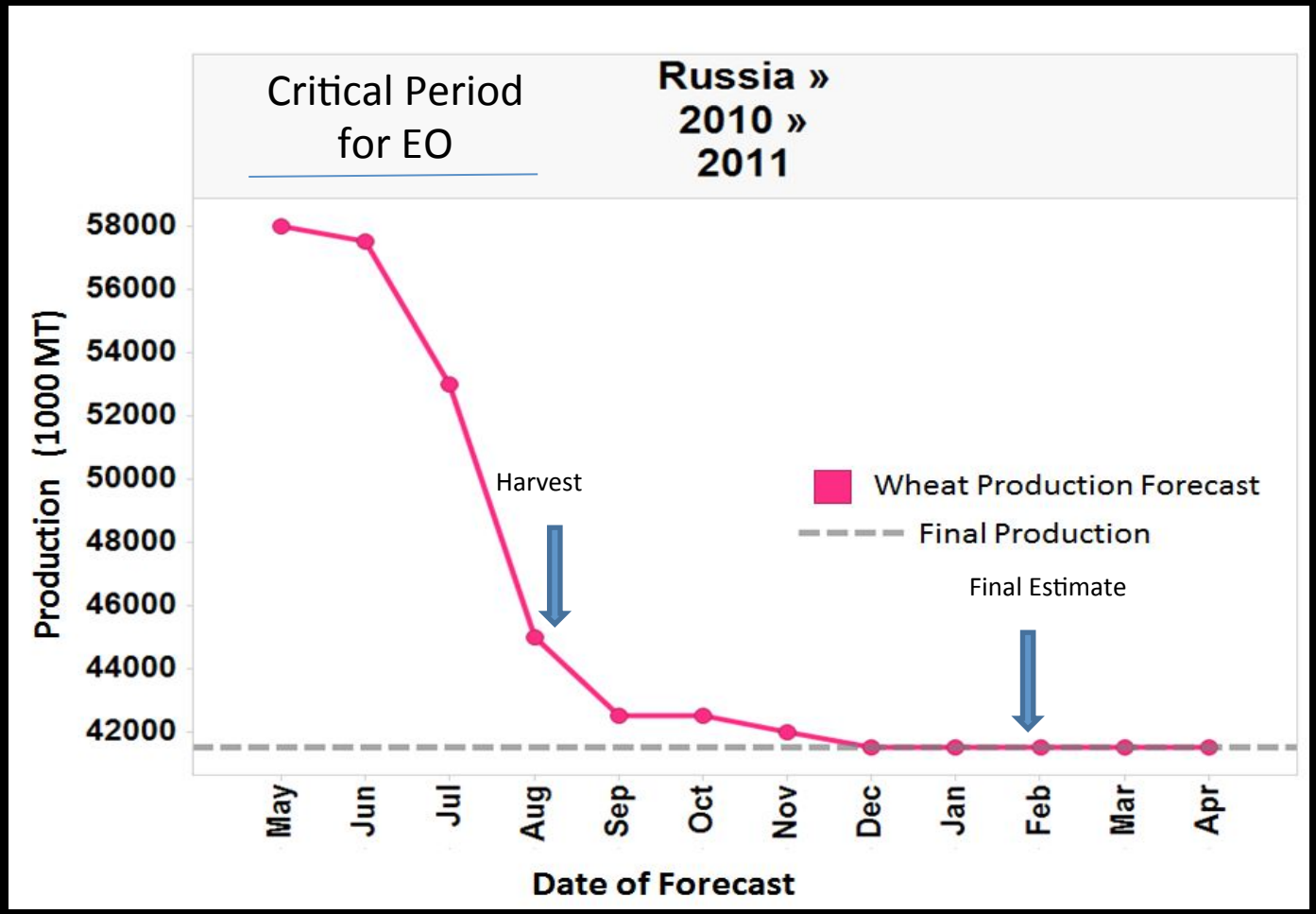


- Low rainfall and hot temperatures were largely responsible for a reduction of 37% percent of the country's grain crops. Global price increased 80% in 6 months

Need timely, trusted, reliable, and accessible forecasts which can help to inform and anticipate trade policies and increase market confidence

GEOGLAM Goal of Timely Information on Crop Production

using repeatable scientific methods to augment current operational procedures




The Washington
NORTH KOREA
Huge Gap Predicted In Supply
guardian.co.uk | The Observer
Food aid to poorest countries slashed as price of grain soars
UN warns of drastic crisis as relief workers urge donor countries to help beat shortages by switching to giving cash or vouchers
Drought is key factor in Kenya's food cri
Matt Brown, Foreign Correspondent
Last Updated: March 27, 2009 9:30AM UAE / March 27, 2009 5:30AM GMT
TARU, Kenya // Rose Mwembe has not had a corn harvest in six months. Last year's late season rains never came and the current rainy season is already a month late, meaning she cannot plant for at least another month.
The arid red earth in front
Poverty/World Hunger
More than 1 billion hungry, UN a
By Tom Eley
WSWS
Thursday, Oct 15, 2009
15 October 2009
More than 1 billion people, one sixth of humani
undernourishment by the end of 2009, two Uni
reported on Wednesday. The ranks of the hun
100 million people in one year, a result of the r
since the Great Depression.
"The State of Food Insecurity," produced by t
Organization (FAO) and the World Food Progra
the sharp increase in global hunger is not the r
natural disasters, but the man-made causes o
unemployment, and declining incomes.
MATT CAWOOD
Climate change compounds Ethiopia's food crisis
AFP - Standing amidst a group of scrawny fellow Ethiopian farmers, Tuke Shika points to the scorching sun when asked why his food reserves have dwindled this year.
"The weather has changed, it's not as it used to be before," he laments. "The rains are increasingly erratic,
The Telegraph
HOME NEWS SPORT FINANCE COMMENT BLOGS CULTURE
UK World Politics Obituaries Education Earth Science Defe
Earth News Environment Climate Change Wildlife Outdoors Pic
HOME » EARTH » GREEN POLITICS » POPULATION
Now we are seven billion, let's feed the world
Why do we reject the technology that would put food on the plates of
The Great Food Crisis of 2011
It's real, and it's not going away anytime soon.
BY LESTER BROWN | JANUARY 10, 2011
As the new year begins, the price of wheat is setting an all-time high in the United Ki
riots are spreading across Algeria. Russia is importing grain to sustain its cattle herd
Bloomberg.com Update
BBC NEWS
Last Updated: Friday, 23 March 2007, 00:25 GMT
Biofuel demand makes food expensive
The New York Times
aturday, May 10, 2008
Food Chain: Drought's To
Every six seconds a child on this planet dies of hunger.
We've had industrial revolutions in the west and more recently in China and South Asia; budding revolutions in
climate change could affect the way we feed the world.
DAILY NATION
MONDAY November 16,
Kenya among food crisis nations, U
SHARE BOOKMARK PRINT EMAIL RATING
landing in her fields. PHOTO/ FILE
BBC Mobile
NEWS AFRICA
Home US & Canada Latin America UK Africa Asia Europe Mid-East Business Health Sci/Environment
Somalia famine: UN warns of 750,000 deaths
As many as 750,000 people could die as Somalia's drought worsens in the coming months, the UN has warned, declaring a famine in a new area.
The UN says tens of thousands of people have
washingtonpost.com > World
Global Food Crisis
The new world of soaring food prices
FOOD INSECURITY
Little Keeps Nigeria From Crisis
BBC NEWS
Watch ONE-MINUTE WORLD NEWS
Bangladesh bans most rice expo
Bangladesh has banned exports of nearly all the rice it produces to prevent shortages and keep food costs down.
The government said the ban began on Tuesday and will last six months.
REUTERS
TIME
IN PARTNERSHIP WITH CNN
The World's Growing Food
By VIVIENNE WALT
WORLD
Food crisis grip rural parts of Nepali Chitwan district
www.chinaview.cn 2009-11-15 11:52:27
The Economist
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World politics Business & finance Economics Science & technology Culture
Africa
Baobab
In pictures
Hunger in the Horn of Africa
Aug 4th 2011, 17:48 by The Economist online
NEVER again, said the world after the horror Ethiopia's famine in 1984. And for years
eparted Africa. But after the worst drought in 60 years, it has
, south-eastern Ethiopia, southern Somalia and Djibouti have
timates that more than 12m people in the Horn of Africa nee
sands have already died and hundreds of thousands more risk
e been annihilated. Hundreds of thousands of people are
mps in search of helo. Malnutrition rates in some areas are fi
TIME
FAMINE
Why are Ethiopians starving again?
What should the world do—and not do?
THE SCIENCE
Gorbachev's Tour de Force
The New York Times
RIAL
e Food Crisis
ed: February 24, 2011
prices are soaring to record levels, thre
tries with mass hunger and political ins
sters of the Group of 20 leading econon
meeting in Paris last week, but for all of
The New York Times
Thursday, November 10, 2011
Time
WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCI
TIMES TOPICS > SUBJECTS > F > FLOODS > 2010 PAKISTAN FLOODS
2010 Pakistan Floods
Rush to Use Crops as Fuel Raises Food Prices and Hunger Fears
Hunger in India: The Crisis Wors
U.N. Food Agency Issues Warning on China Drought
Food security for 7 billio
afis Sadik, the
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and serves on
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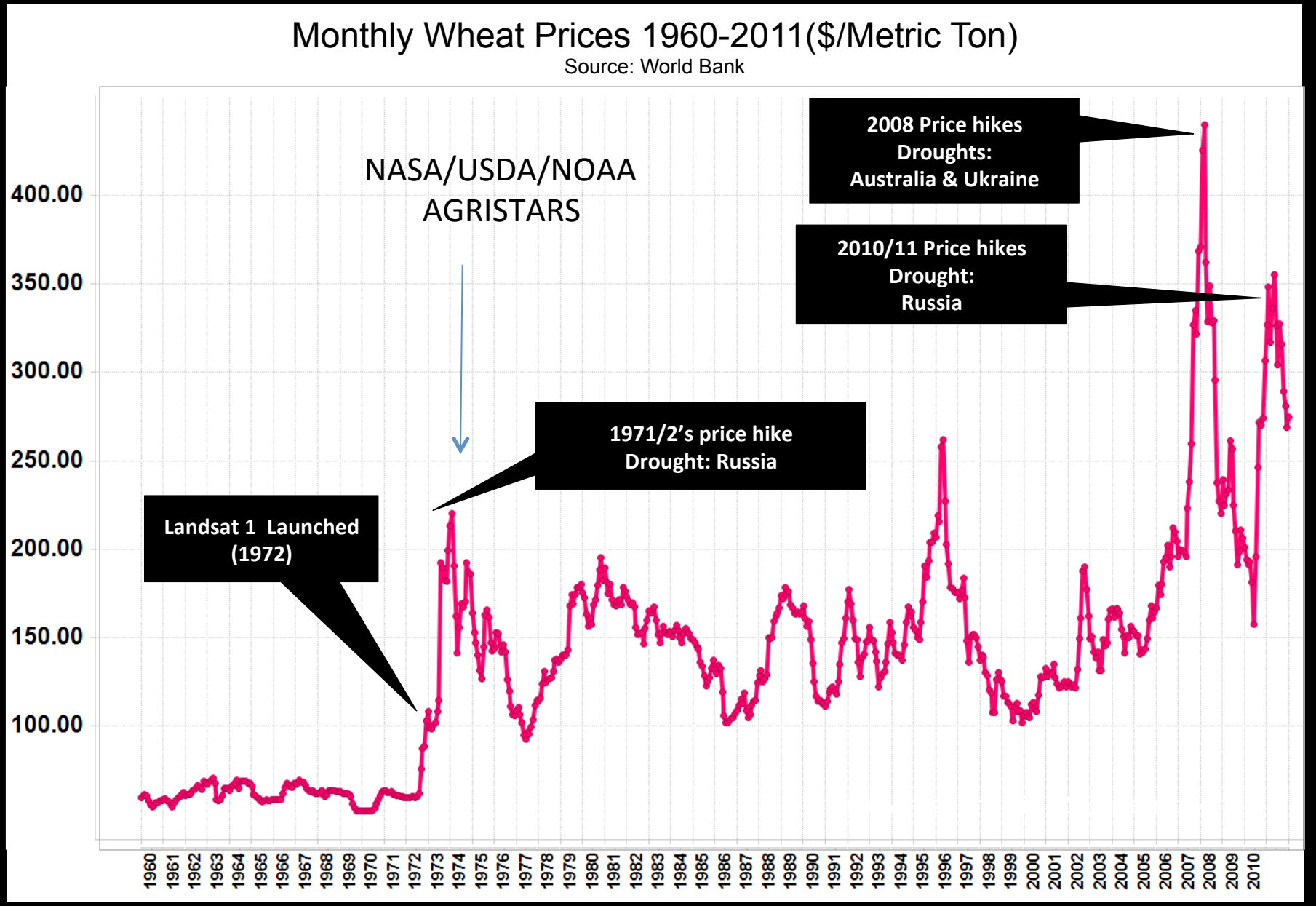
2000.
y somewhere
st the 7 billion
ebrate. Few

Shortfalls due to droughts in main crop producing countries were large factors leading to the food price hikes in recent years



GROUP ON EARTH OBSERVATIONS

Background : the G20 Agriculture priority (2011)

G20 Final Declaration – Cannes, November 2011

*44. We commit to **improve market information and transparency** in order to make international markets for agricultural commodities more effective. To that end, we launched:*

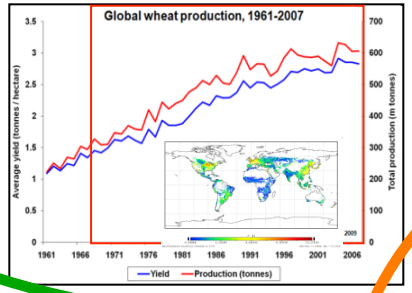
*The **"Agricultural Market Information System" (AMIS)** in Rome on September 15, 2011, to improve information on markets ...;*

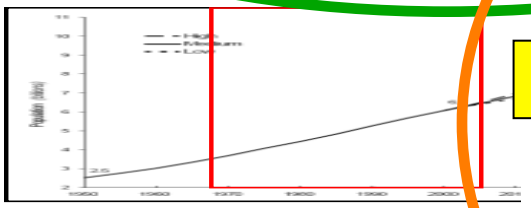
*The **"Global Agricultural Geo-monitoring Initiative" (GEOGLAM)** in Geneva on September 22-23, 2011. This initiative will coordinate satellite monitoring observation systems in different regions of the world in order to enhance crop production projections and weather forecasting data.*

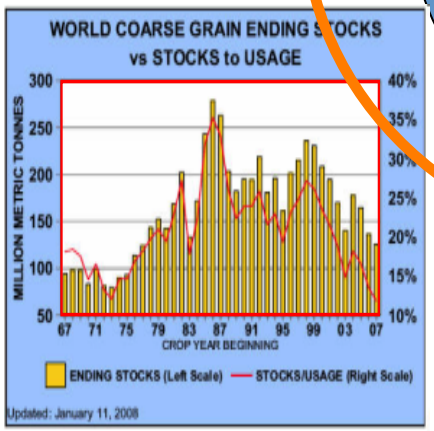
Background : the G20 Agriculture priority (2011)

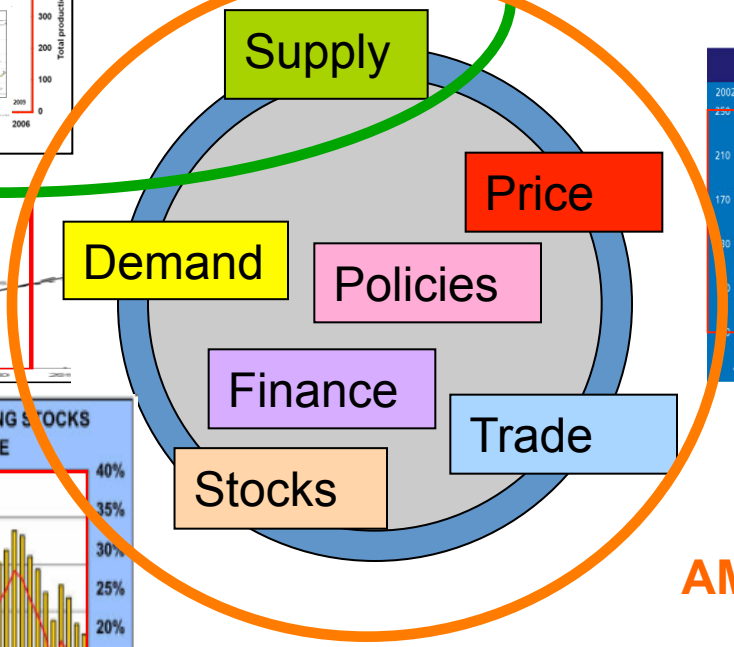
GEOGLAM

2 initiatives to increase information availability, quality and transparency

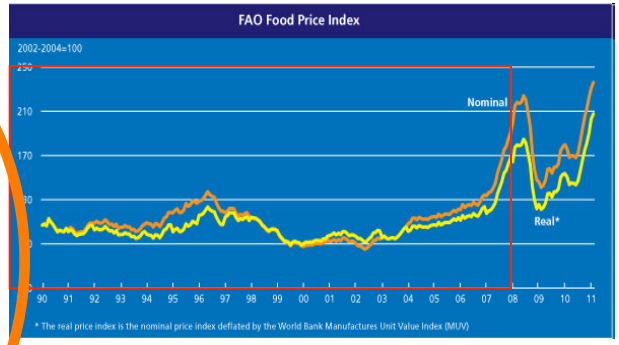








AMIS



G20 requested a linkage between GEOGLAM and AMIS

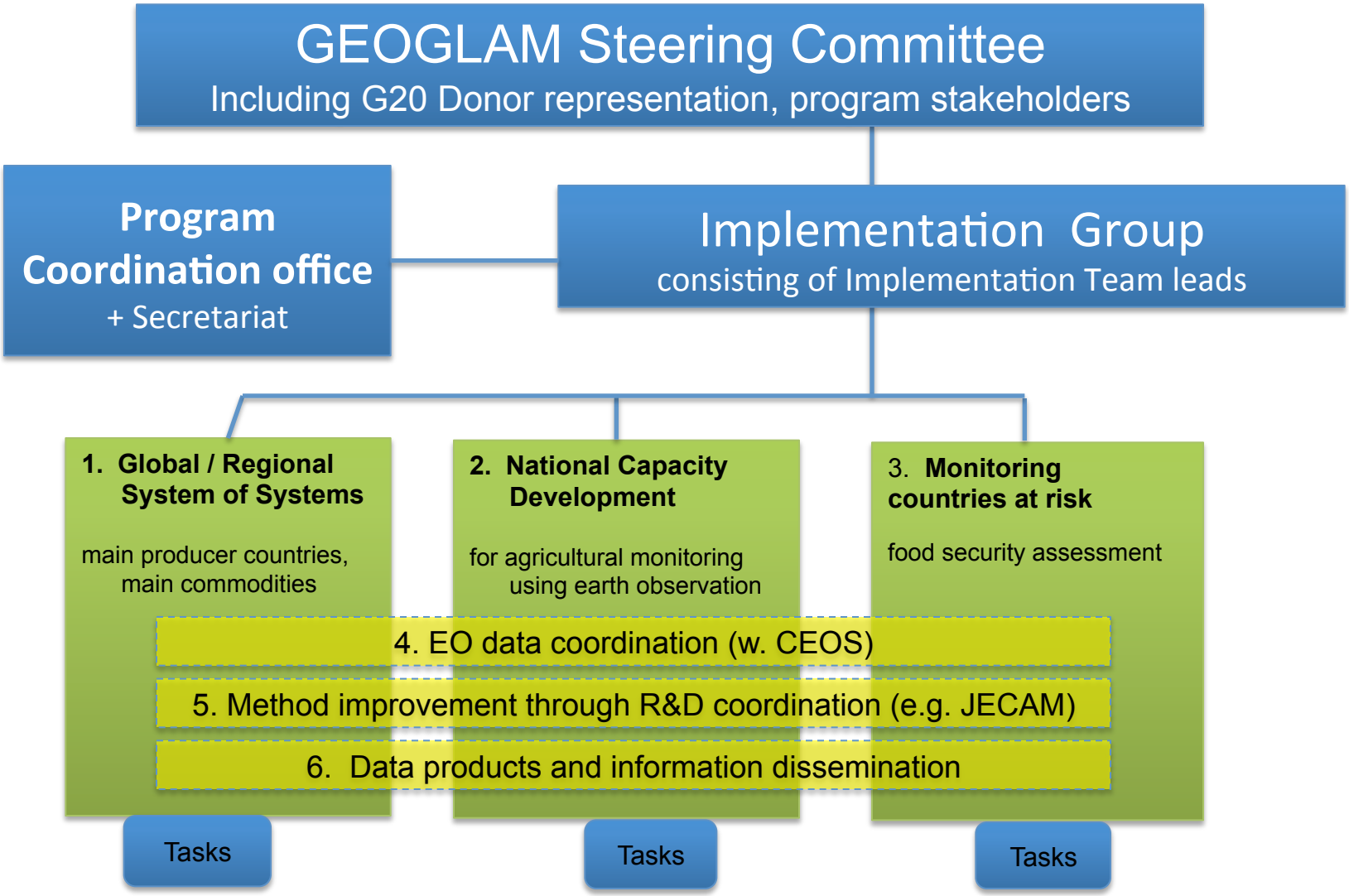
GROUP ON EARTH OBSERVATIONS

GEOGLAM: GOAL AND SCOPE

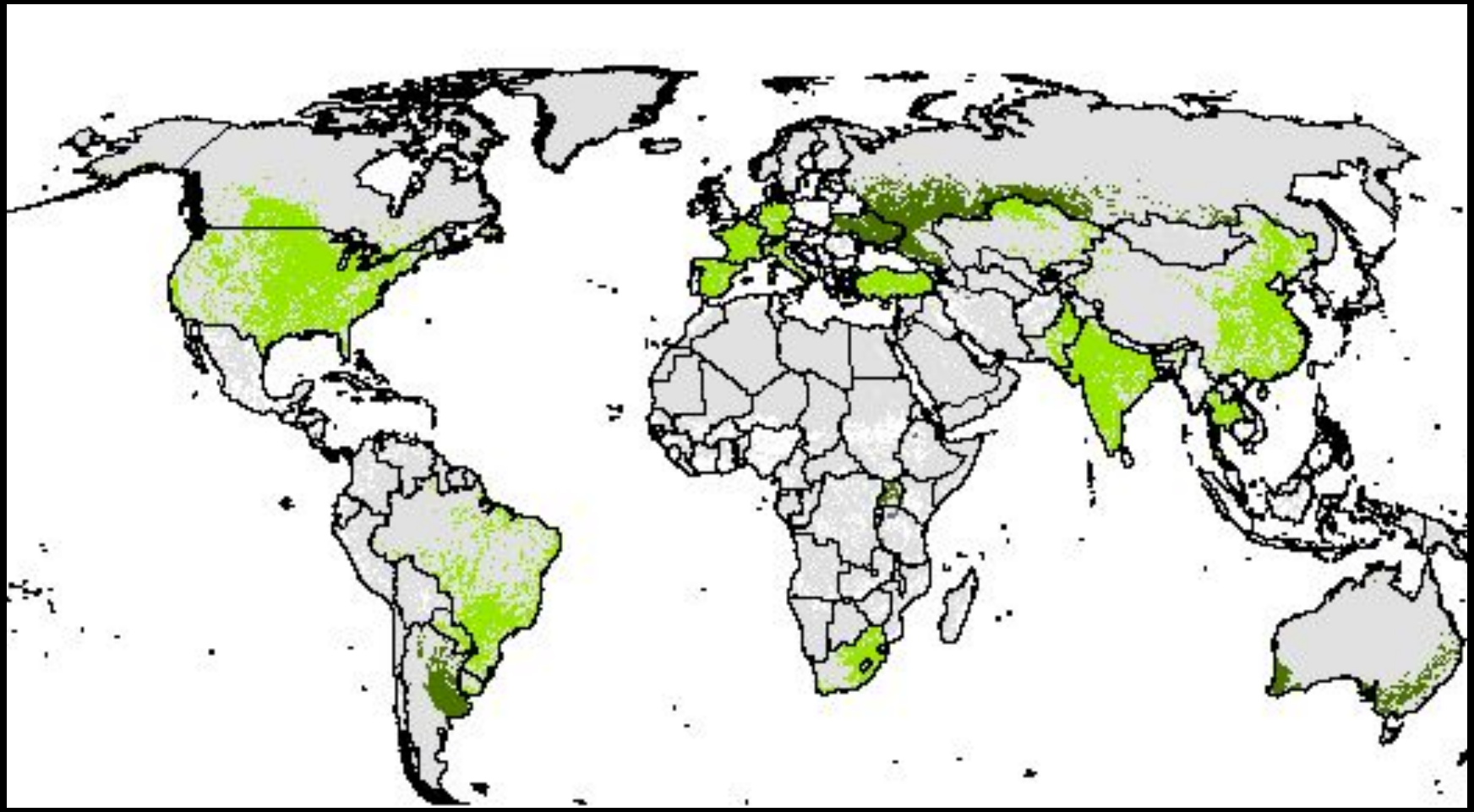
- To strengthen the international community's capacity to produce and disseminate relevant information on agricultural production at national, regional and global scales, through reinforced use of Earth Observations.
- GEOGLAM is a 'coordination program', aiming at:
  - supporting, strengthening and articulating existing efforts through the use of EO
  - developing capacities and awareness at national and global level
  - improving availability and open access to data and disseminating information

GROUP ON EARTH OBSERVATIONS

GEOGLAM Governance Model

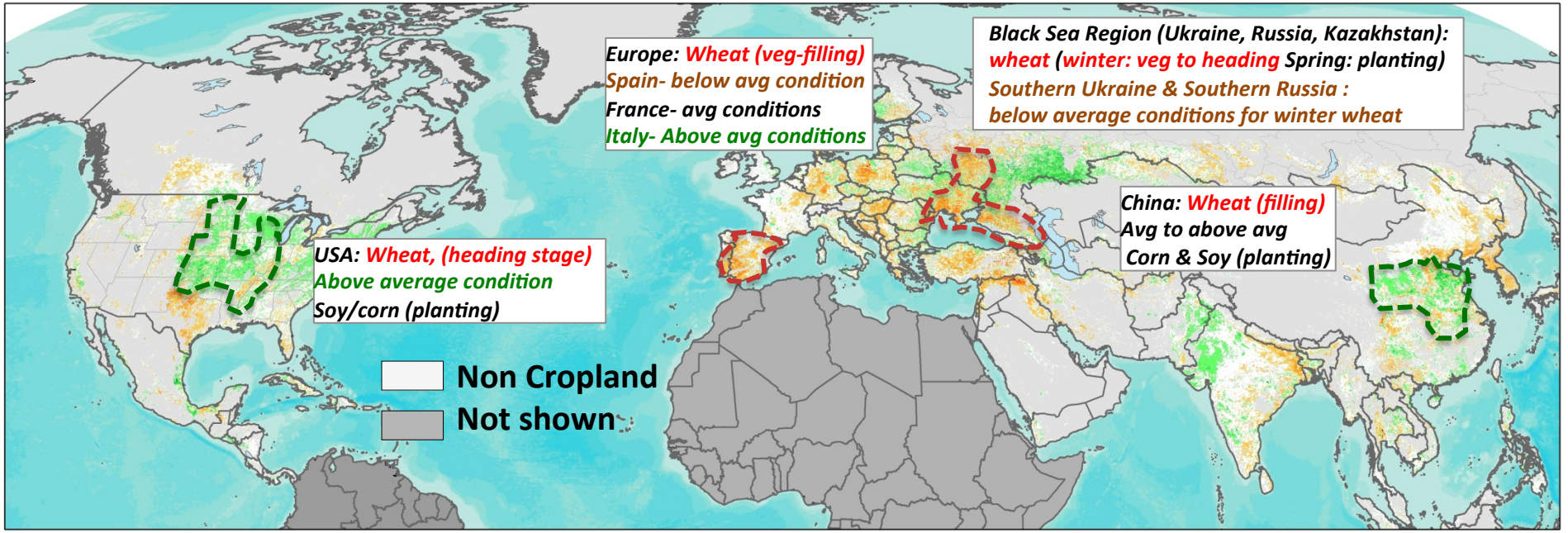


Countries responsible for 96% of total world exports of corn, soy, wheat and rice combined



The focus for AMIS

Northern Hemisphere Satellite Derived Crop NDVI Anomaly relative to Average (2000-2011)
May 1st, 2012



Crop NDVI Anomaly

-0.4	0	0.4
Worse than normal	normal	Better than normal

Orange and brown indicate crop with below average conditions

Green indicates crop with above average condition

Crops in development stages sensitive to drought conditions are highlighted in red next to each each region.

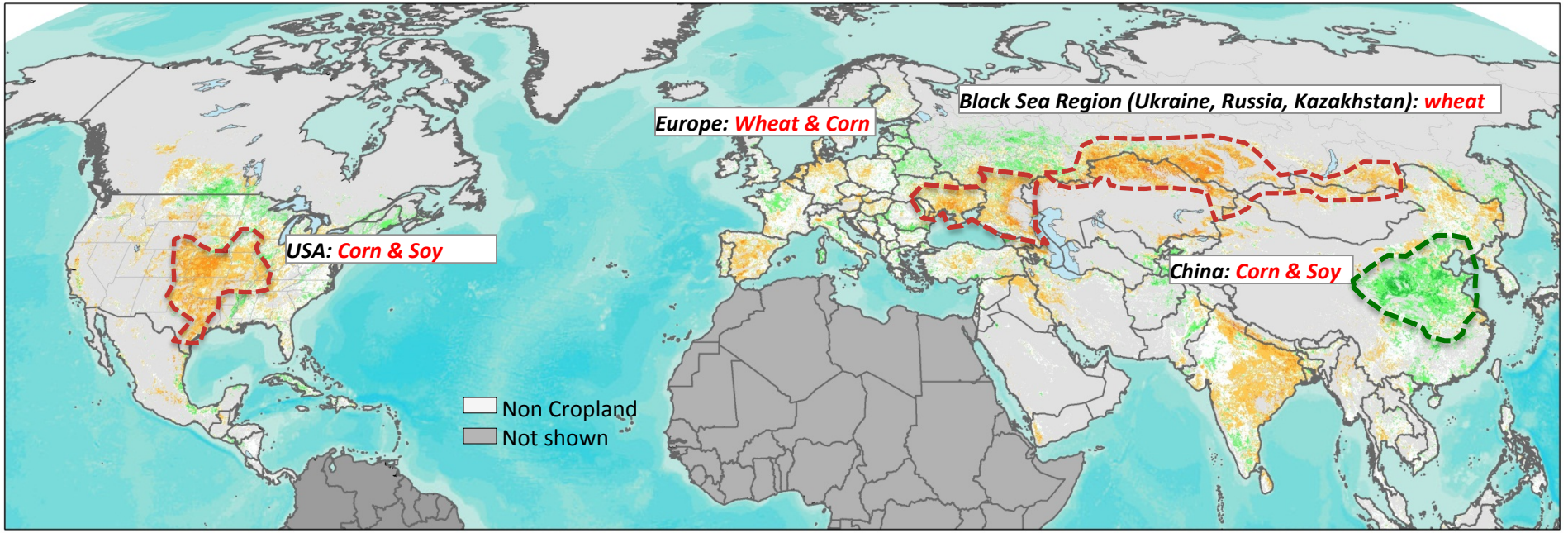
- Only Croplands are shown

- *Crop stage sensitive to moisture and temperature*
- Crop stages largely based on USDA/NOAA Joint Agricultural Weather Facility (JAWF

GEOGLAM Global Agricultural Monitoring

Crop NDVI Anomaly relative to Average (2000-2011)

June 1st, 2012



Crop NDVI Anomaly

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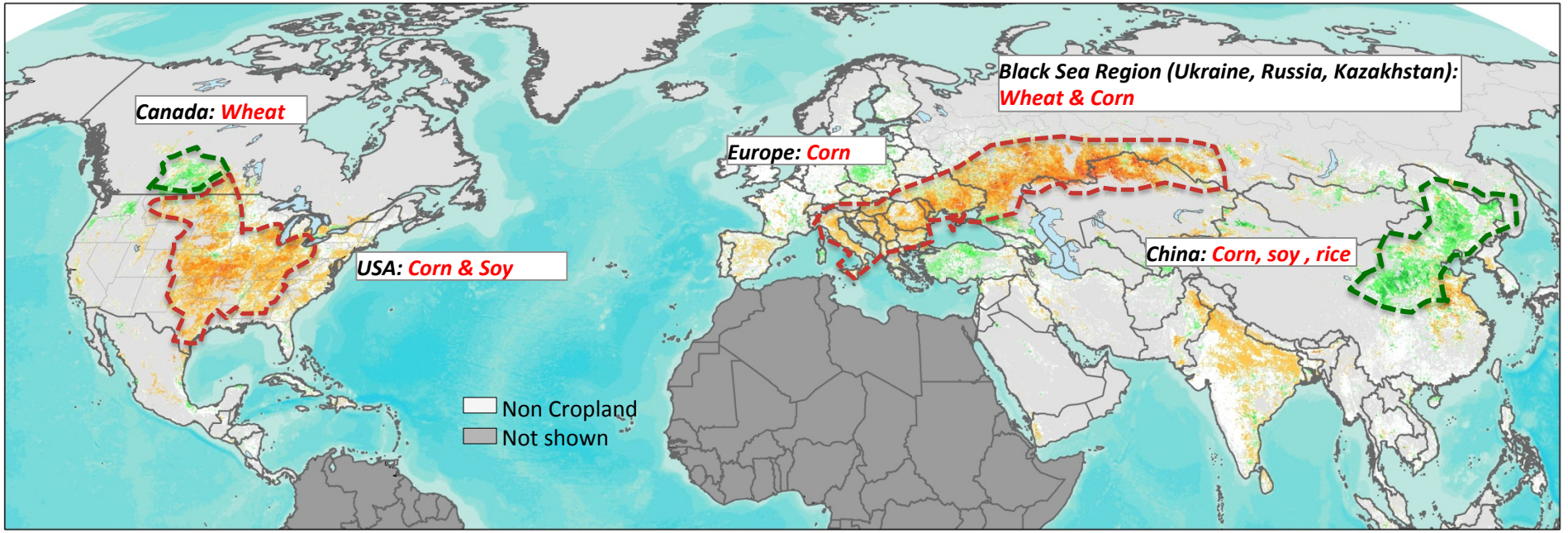
- Crop stages largely based on USDA/NOAA Joint Agricultural Weather Facility (JAWF

(Data source: NASA MODIS) processed at UMD

GEOGLAM Global Agricultural Monitoring

Crop NDVI Anomaly relative to Average (2000-2011)

July 15th, 2012



Crop NDVI Anomaly

-0.4	0	0.4
Worse than normal	normal	Better than normal

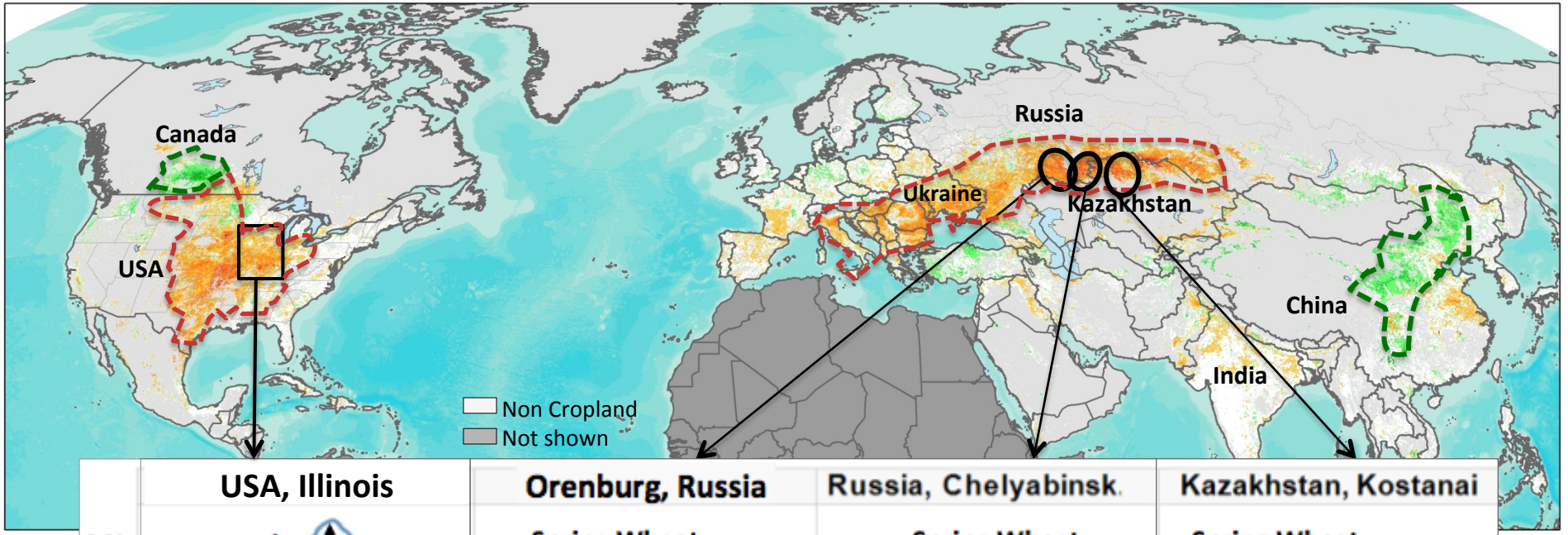
- US NDVI anoms persist
- Ukraine NDVI anoms continues and spread north
- Russia, Kazakhstan NDVI anoms intensifying
- Positive NDVI anoms in China & Canadian praries

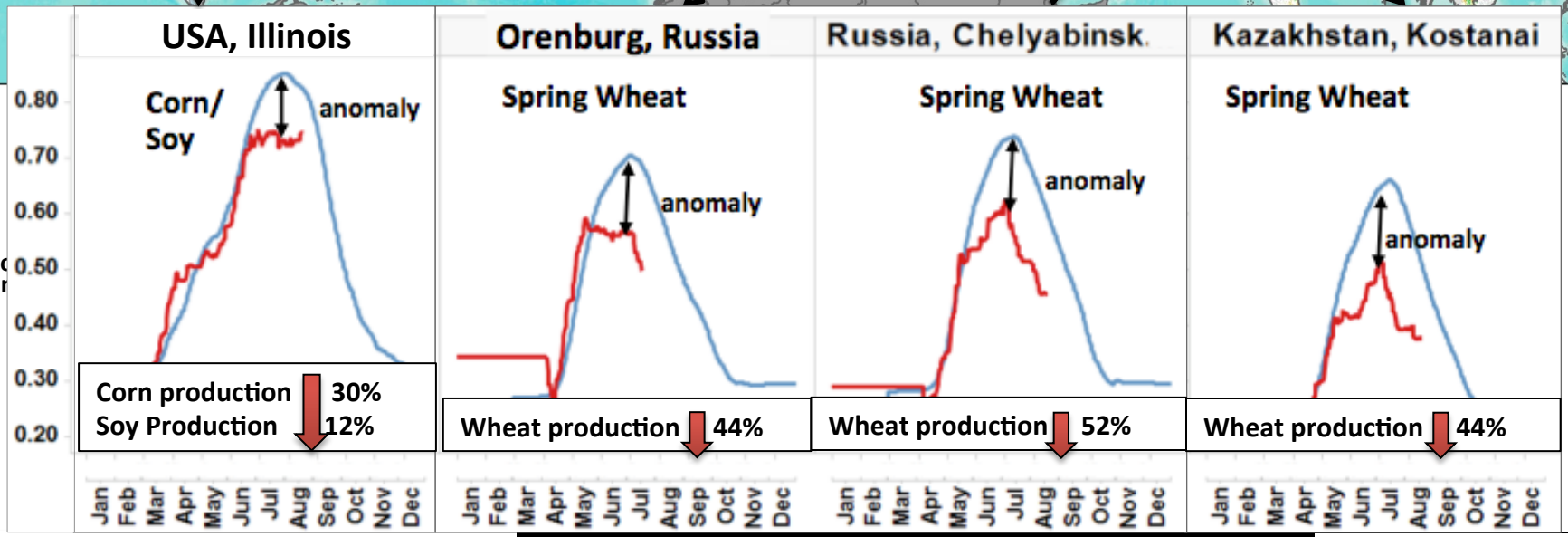
- *Crop stage sensitive to moisture and temperature*
- Crop stages largely based on USDA/NOAA Joint Agricultural Weather Facility (JAWF

GEOGLAM Global Agricultural Monitoring

Crop NDVI Anomaly relative to Average (2000-2011)

August 15th, 2012



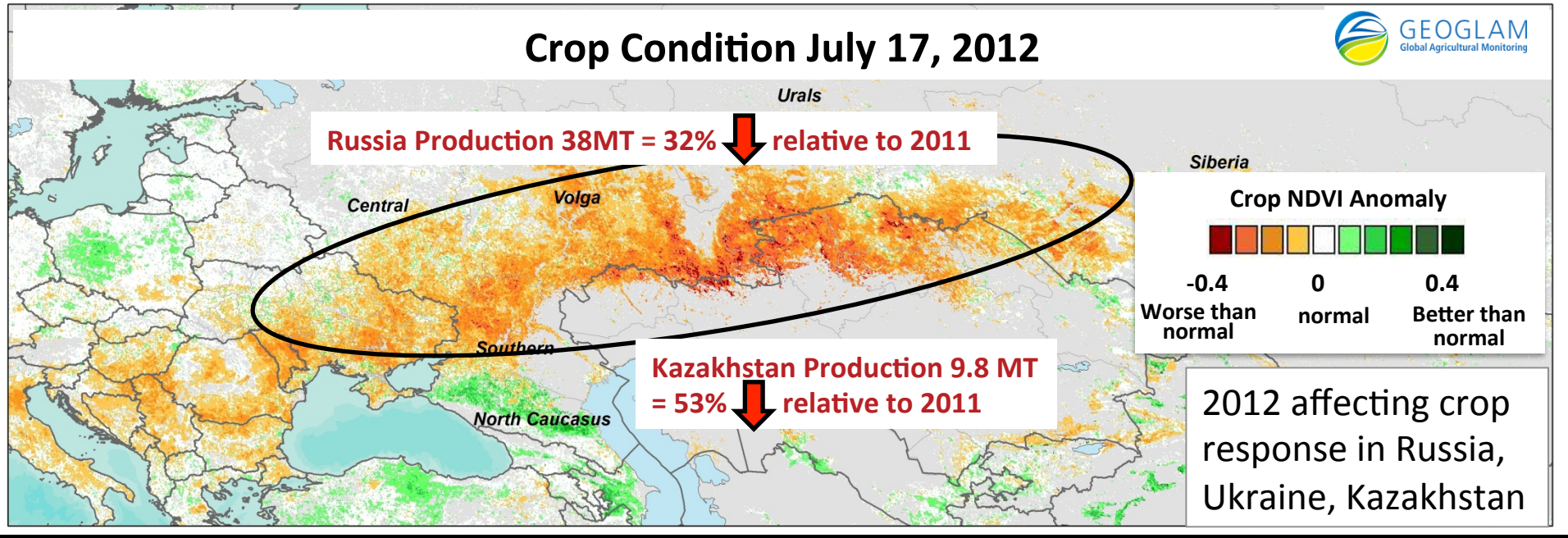


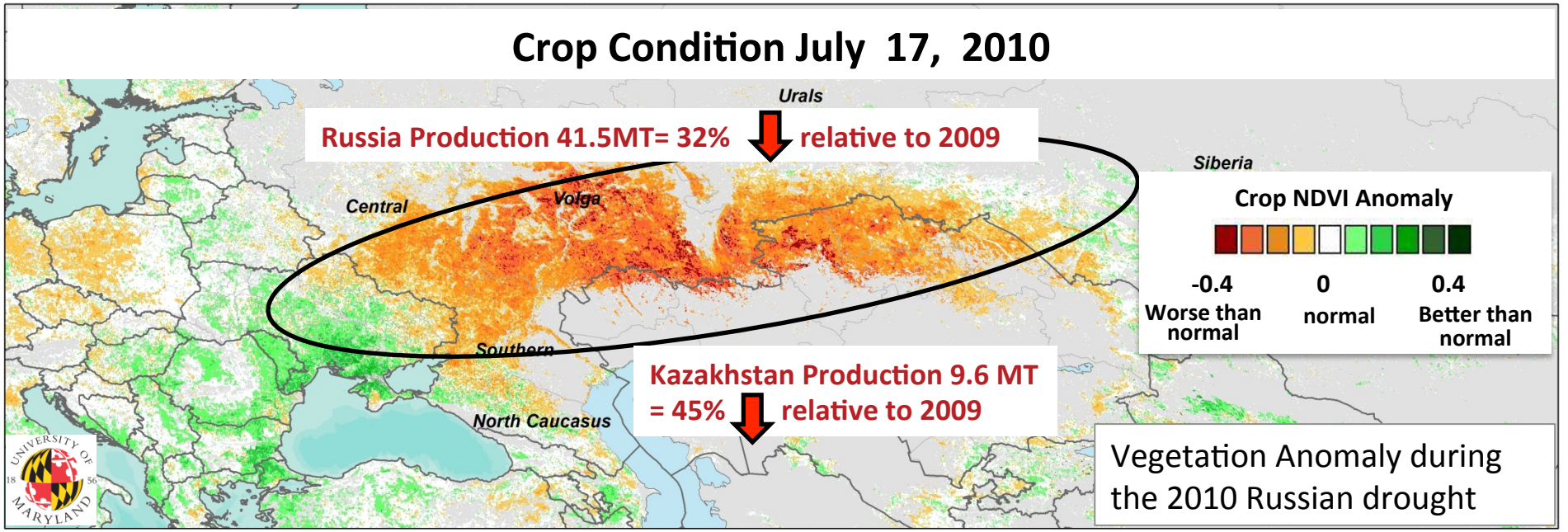
Current season crop development (2012)
Average season development (2000-2011)

Stats: USA- USDA NASS, Russia- Rosstat , Kazakhstan- SSA

GEOGLAM
Global Agricultural Monitoring

Comparing the 2012 Drought to the 2010 Drought

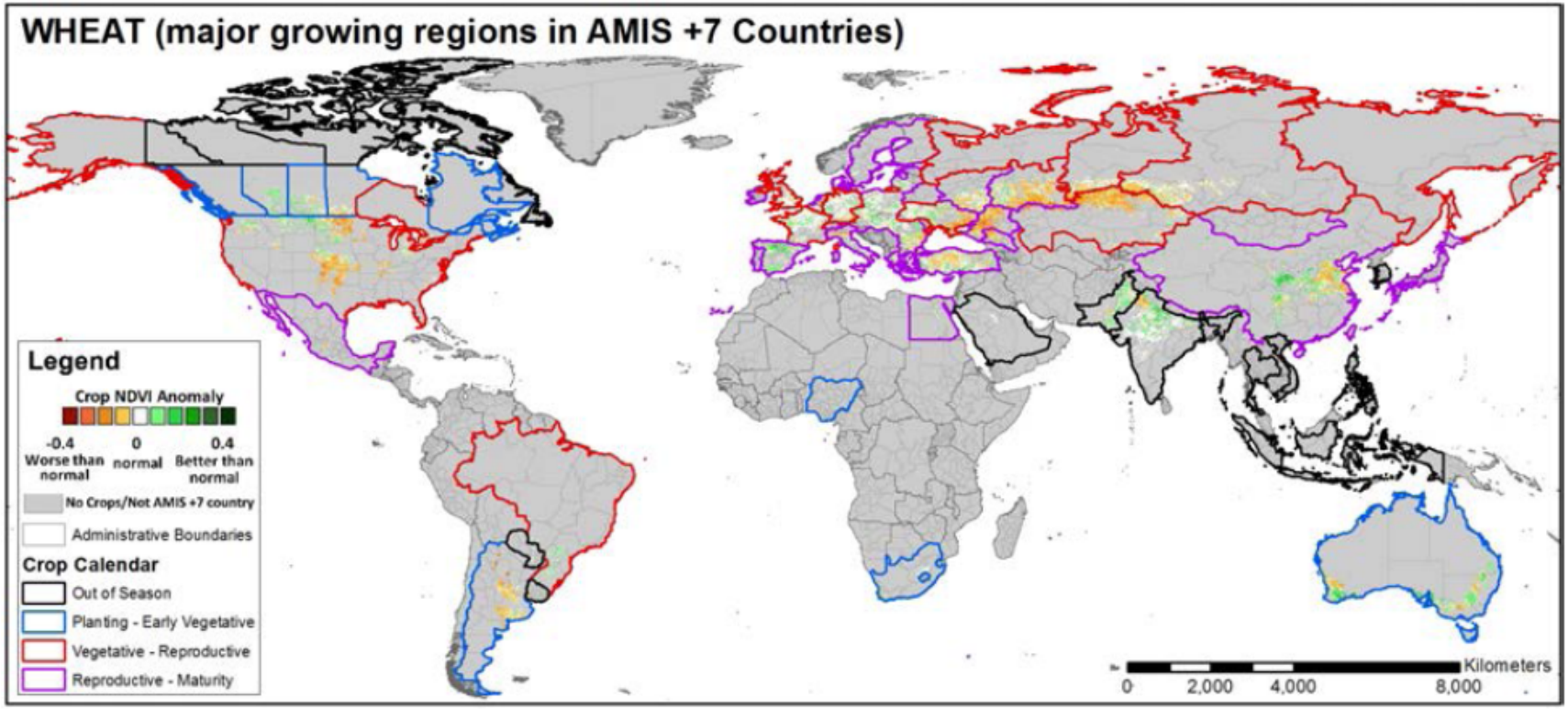




GROUP ON EARTH OBSERVATIONS

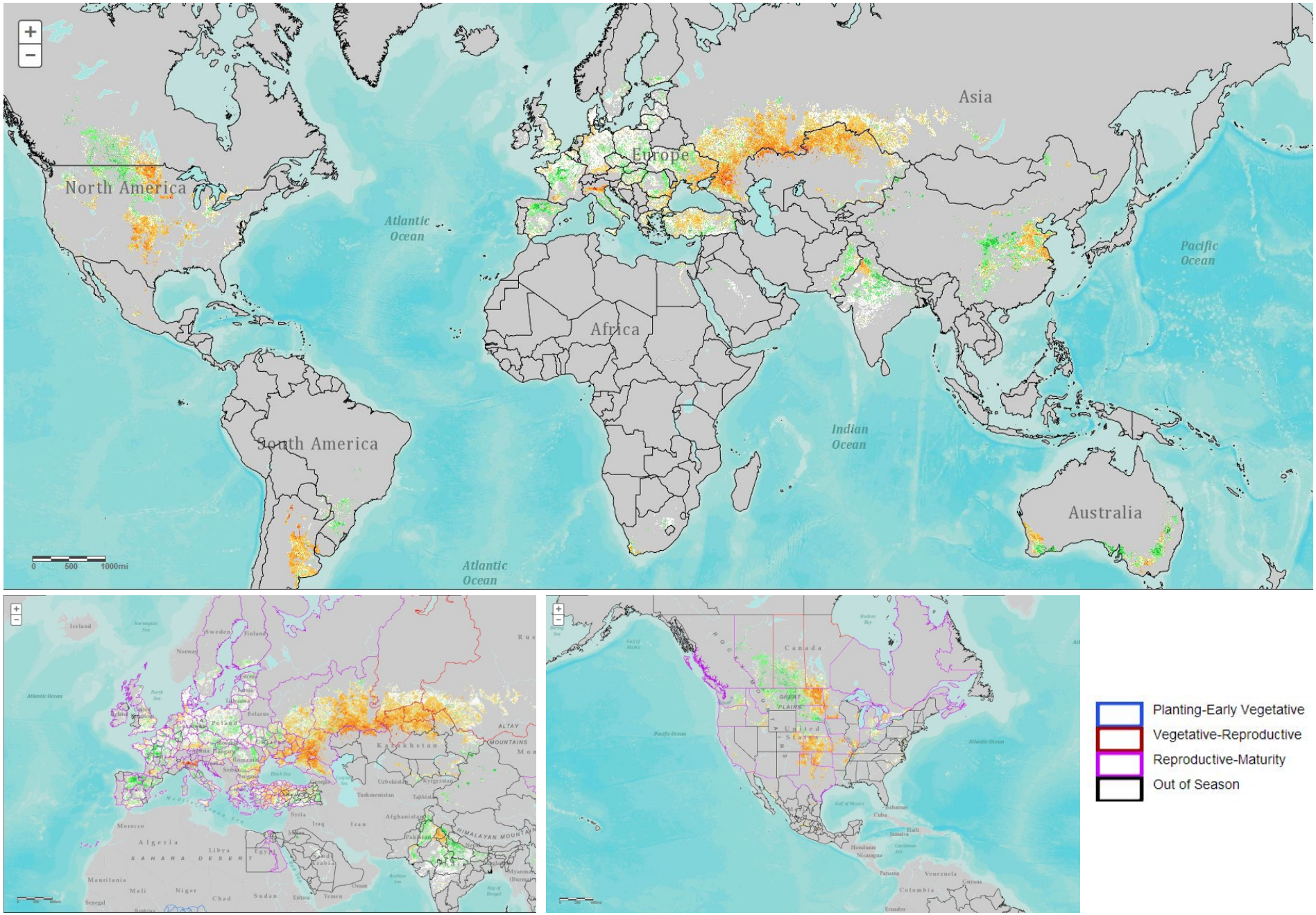
Global Crop Assessment : Phase 1 Global Component

Wheat

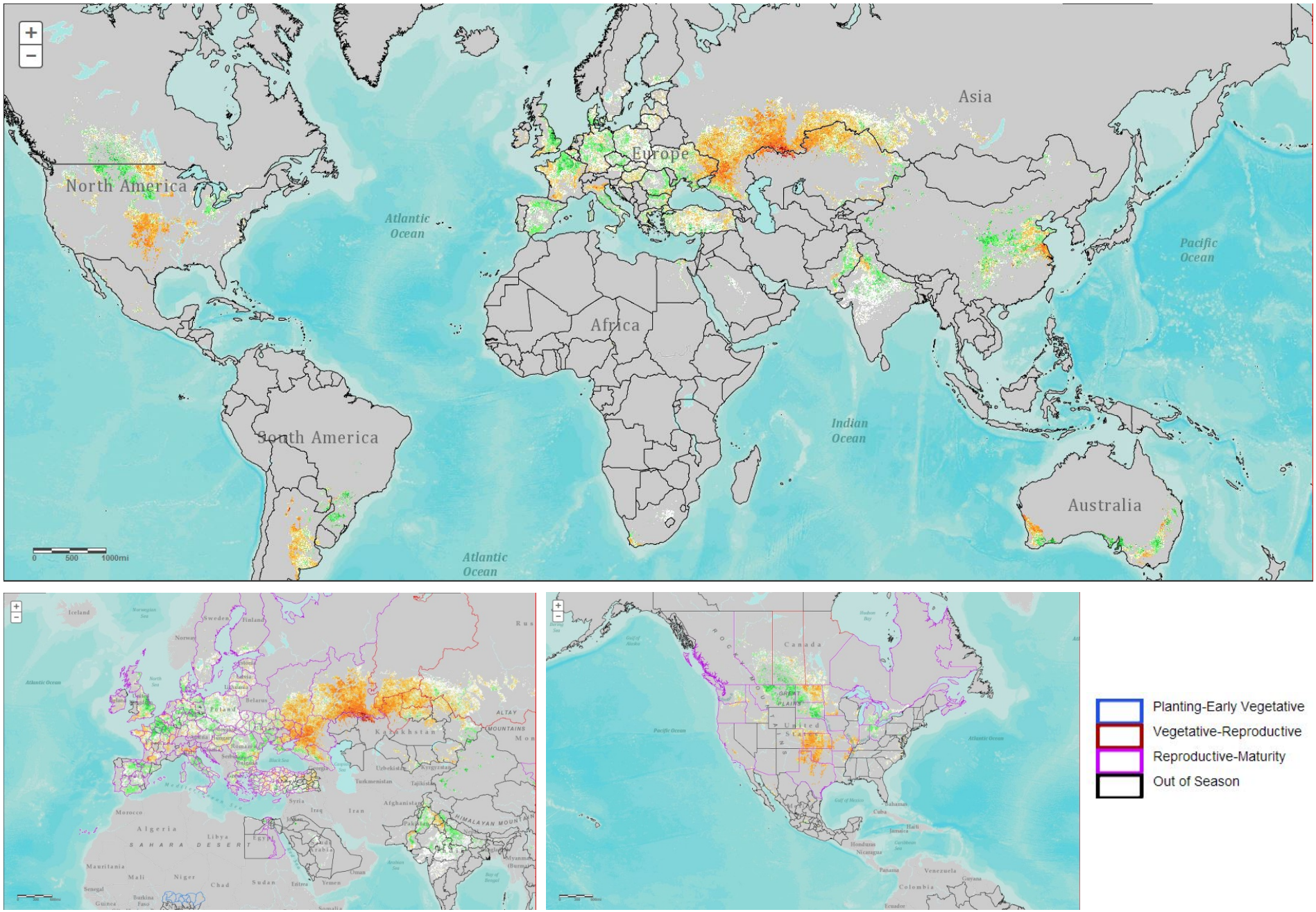


NDVI anomaly image (NASA MODIS) depicting vegetative growth anomalies on June 29th over the main wheat growing areas. (Orange to red indicates less green vegetation than average, green indicates higher than average vegetation). Colors of country outlines refer to growth stage: Blue- planting to early vegetative, Red- Vegetative to Reproductive, Purple- Reproductive to Maturity, Black- out of season. Note: only AMIS+7 countries are highlighted.

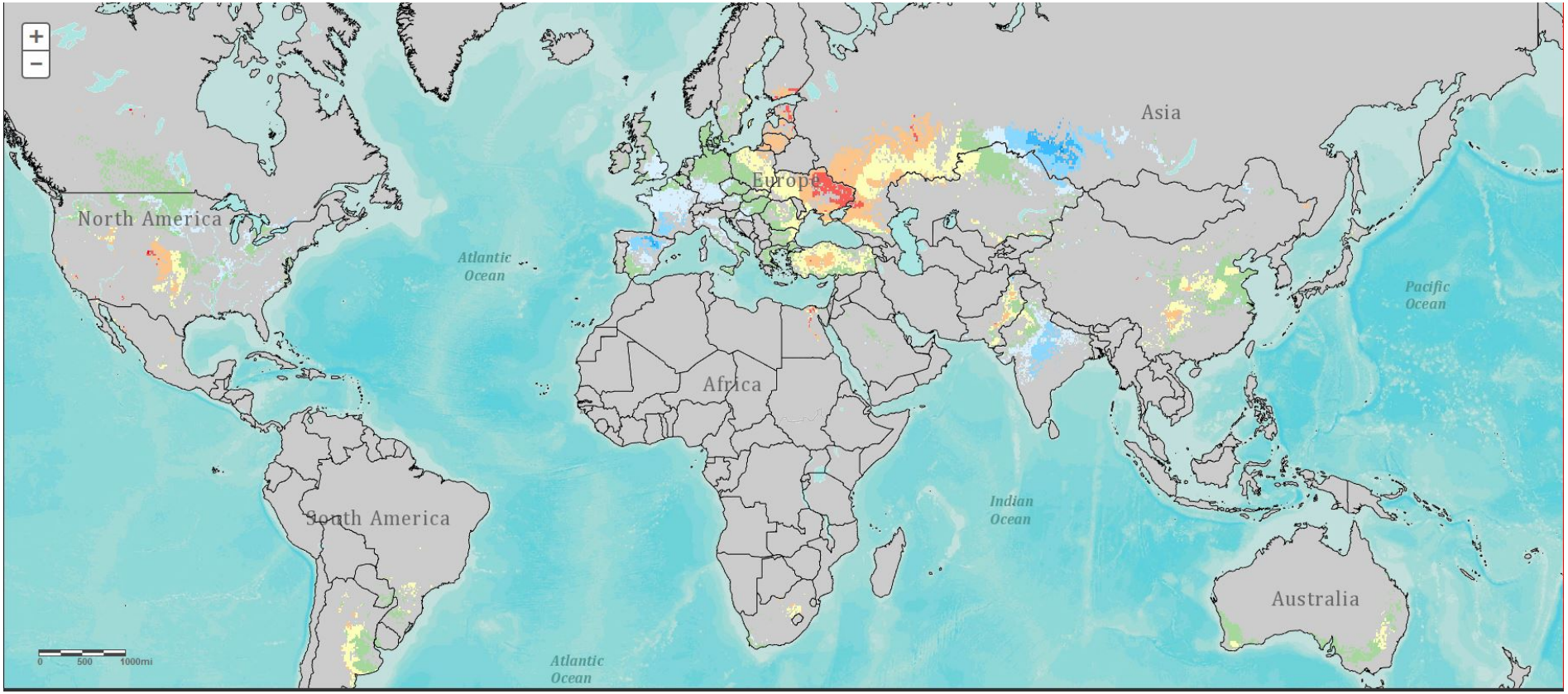
July 1st 2013 NDVI Anomaly

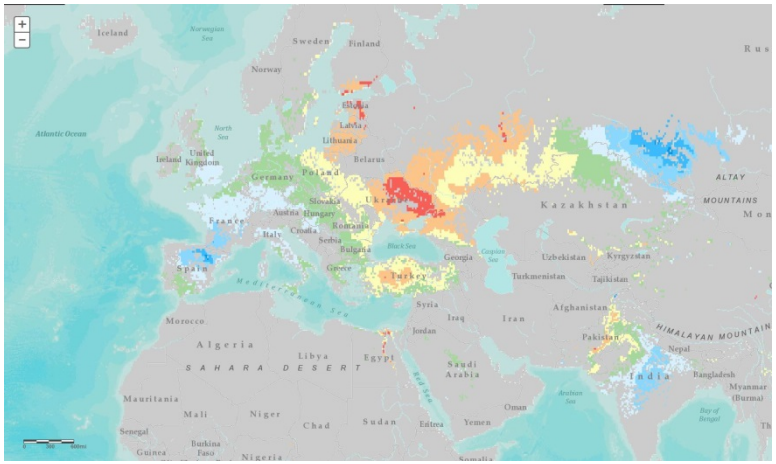


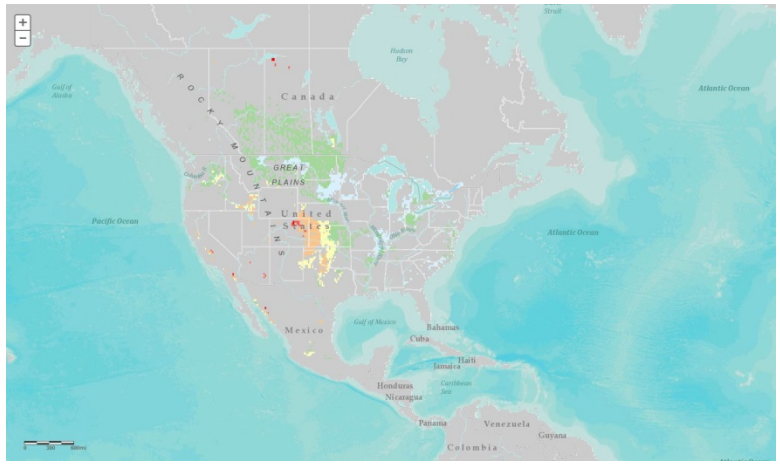
July 15st 2013 NDVI Anomaly

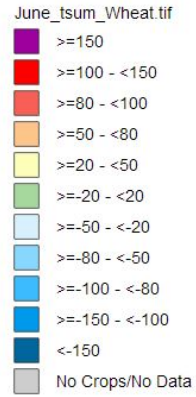


June 2013 Temperature Sum

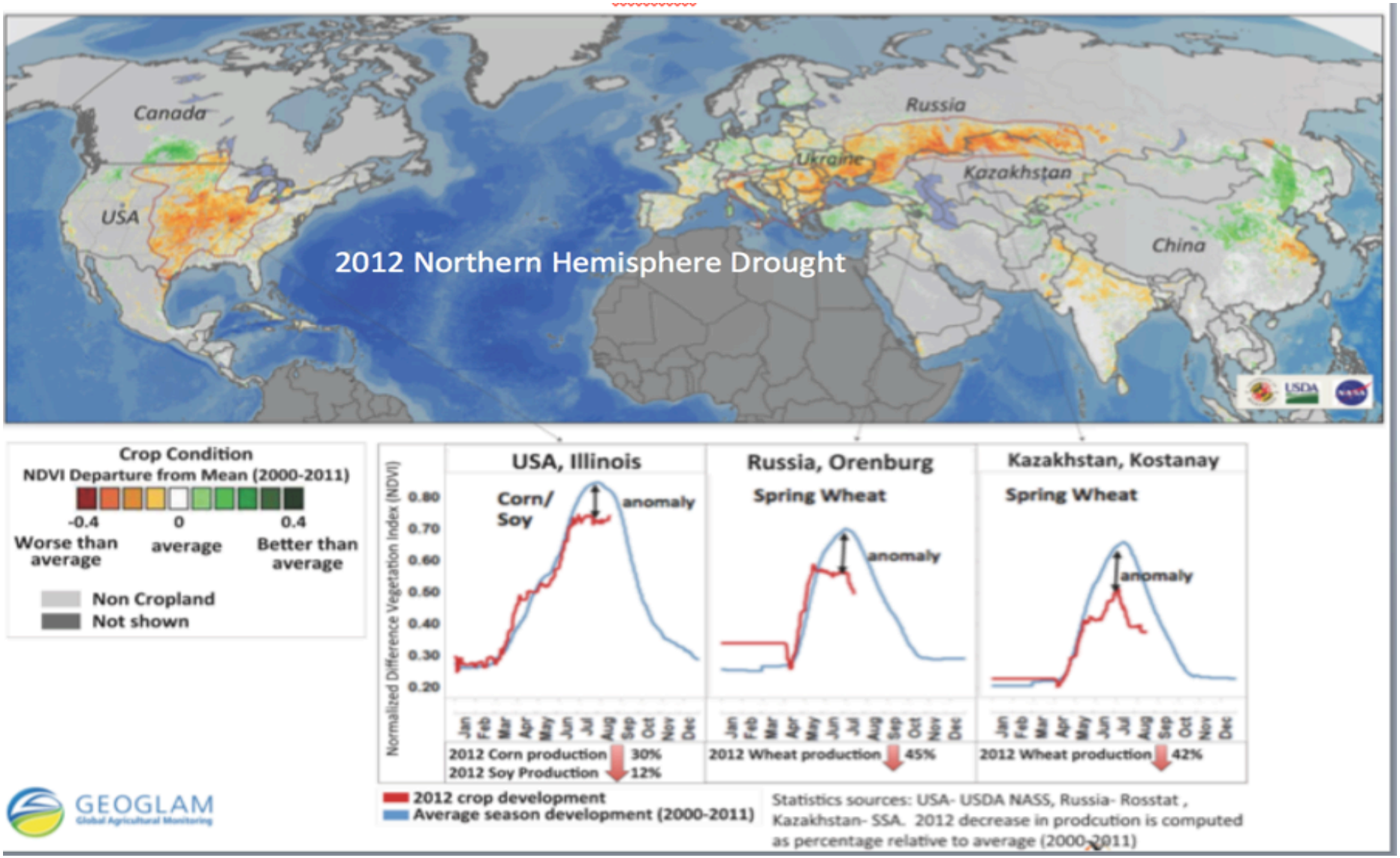




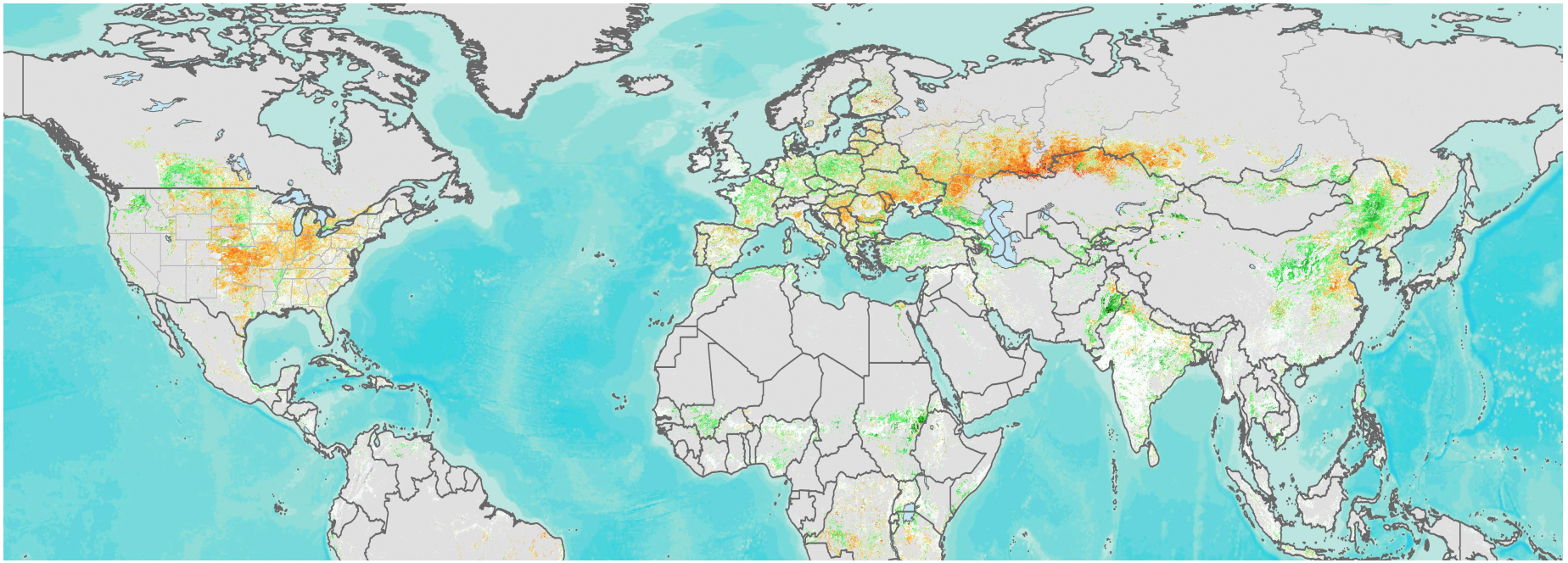




MODIS NDVI Anomaly July 30th 2012



Prototype VIIRS NDVI Anomaly, July 30th 2012

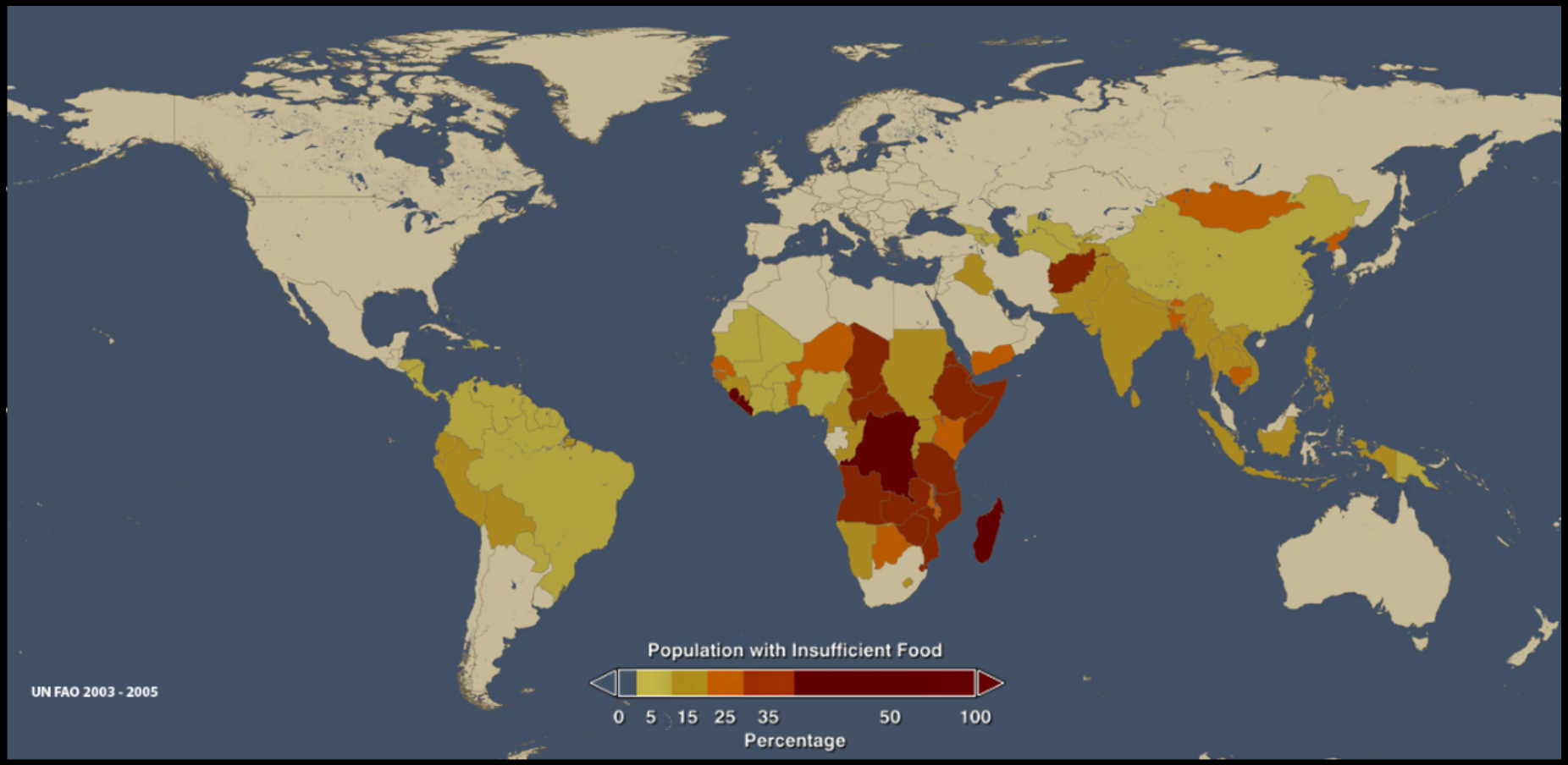


A VIIRS NDVI anomaly (prototype) image computed for the same date (July, 30th 2012) as the MODIS NDVI anomaly shown in the previous slide, generated from data produced at the GSFC Land PEATE.

Vermote 2013

Percent of Population by Country with Insufficient Food

UN FAO 2003-2005



Primary countries at Risk

FEWS NET Reporting for Early Warning & Monitoring…

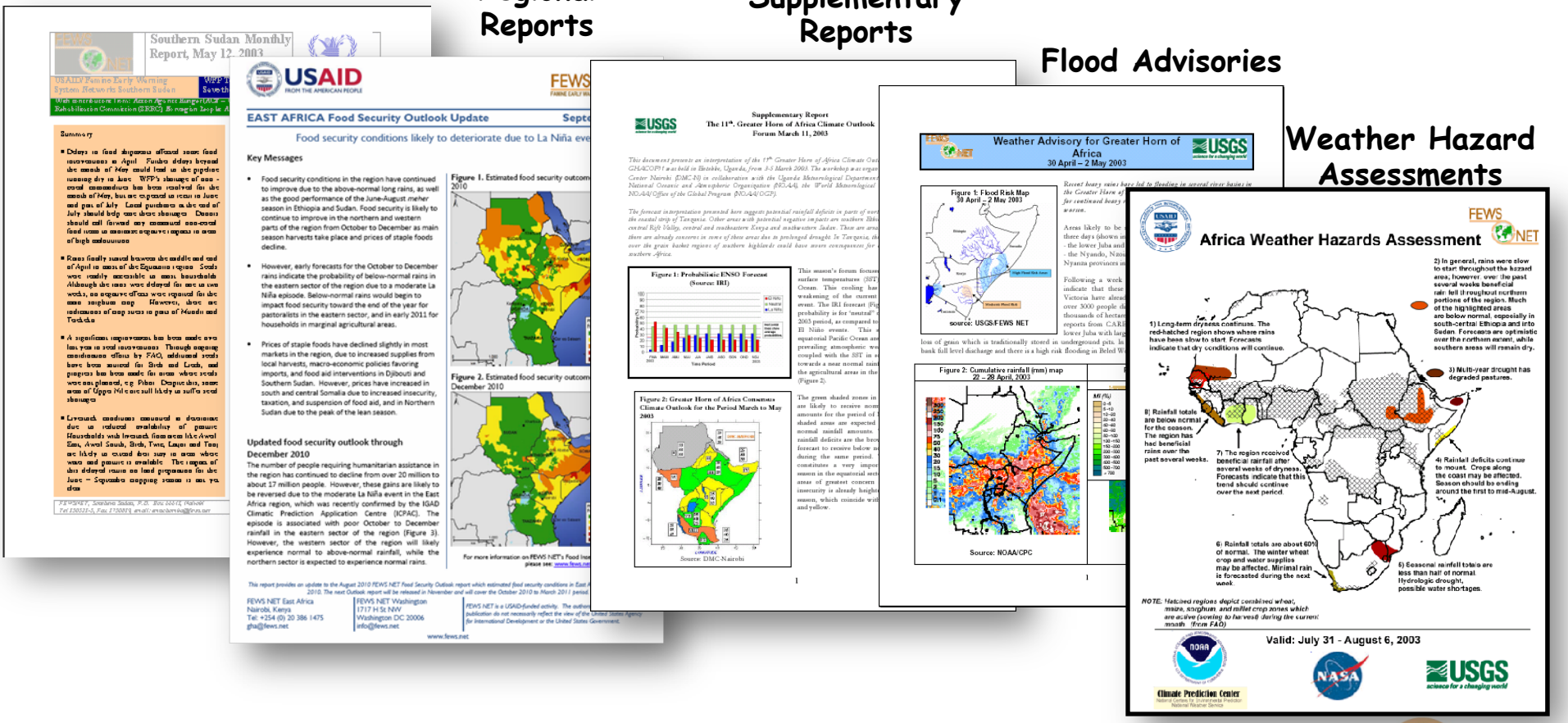
National Reports

Regional Reports

Supplementary Reports

Flood Advisories

Weather Hazard Assessments

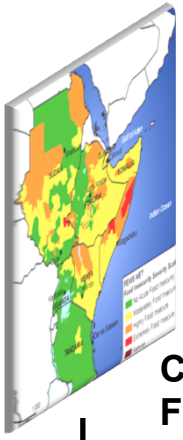


Courtesy Jim Verdin USGS

USGS science for a changing world

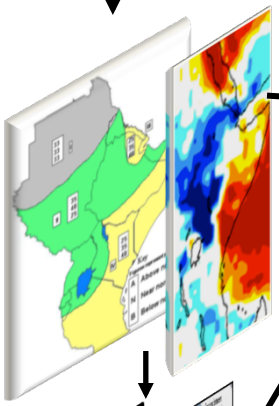
FEWS NET FAMINE EARLY WARNING SYSTEMS NETWORK

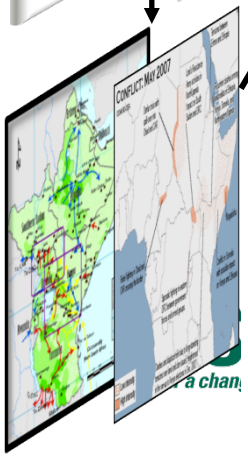
Food Security Outlooks



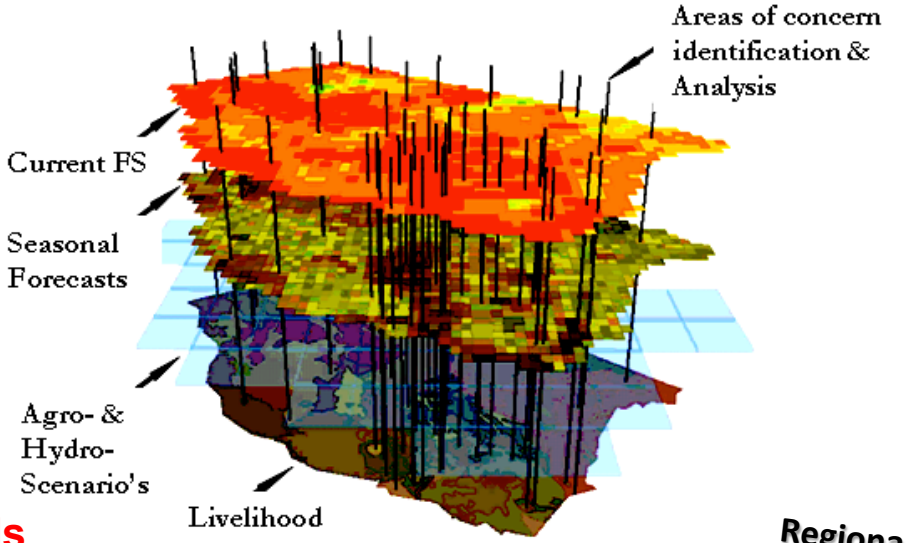
Current FS status

Climate Forecasts

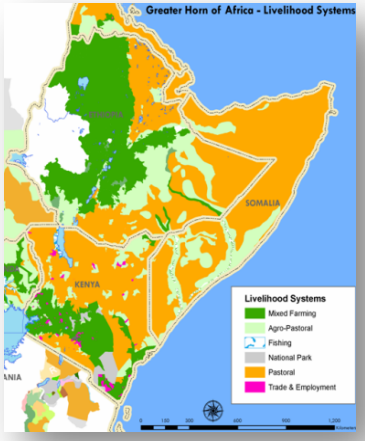




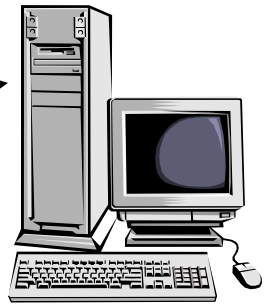
Other info: Trade, Conflicts, Health…



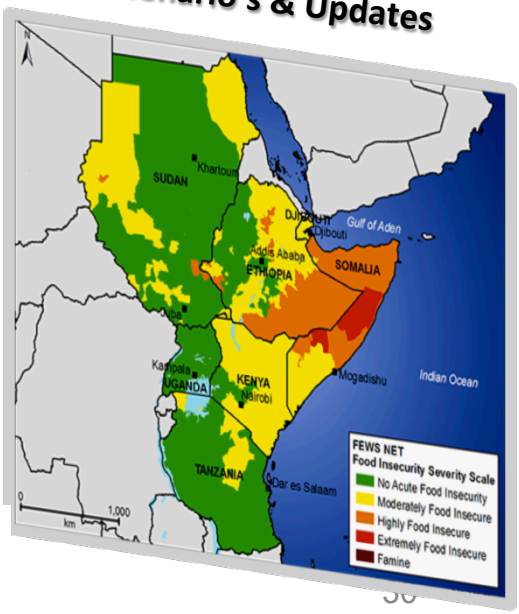
Livelihoods



Seasonal Calendar

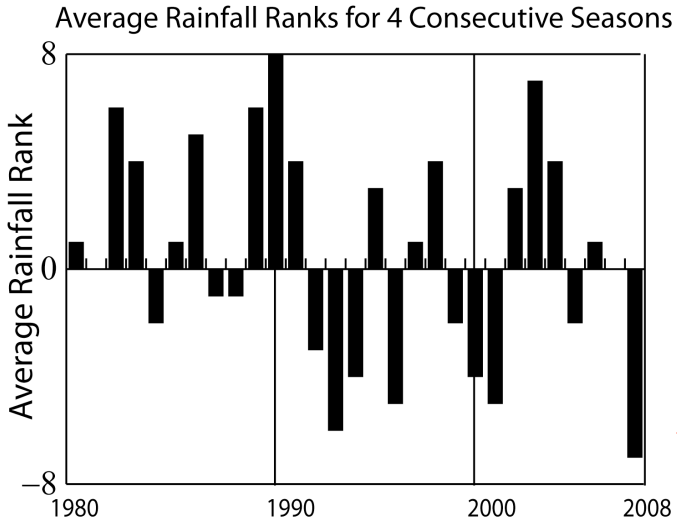


Regional & National FSO Scenario's & Updates



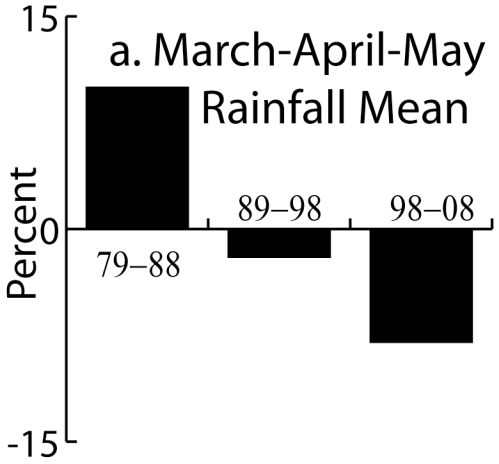
Courtesy Jim Verdin USGS
FEWS NET

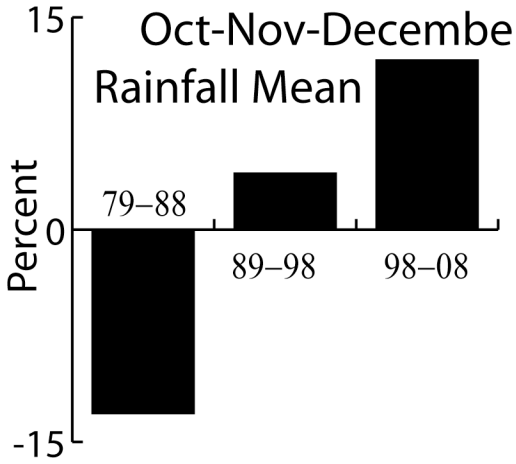
Trends: Precipitation changes in Kenya, 1980 – 2008



Last 4 rainy seasons are ranked lowest

Almost 20% drop in main season rainfall since 1980





Main season rainfall decreasing, while second season is increasing

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Courtesy Jim Verdin USGS

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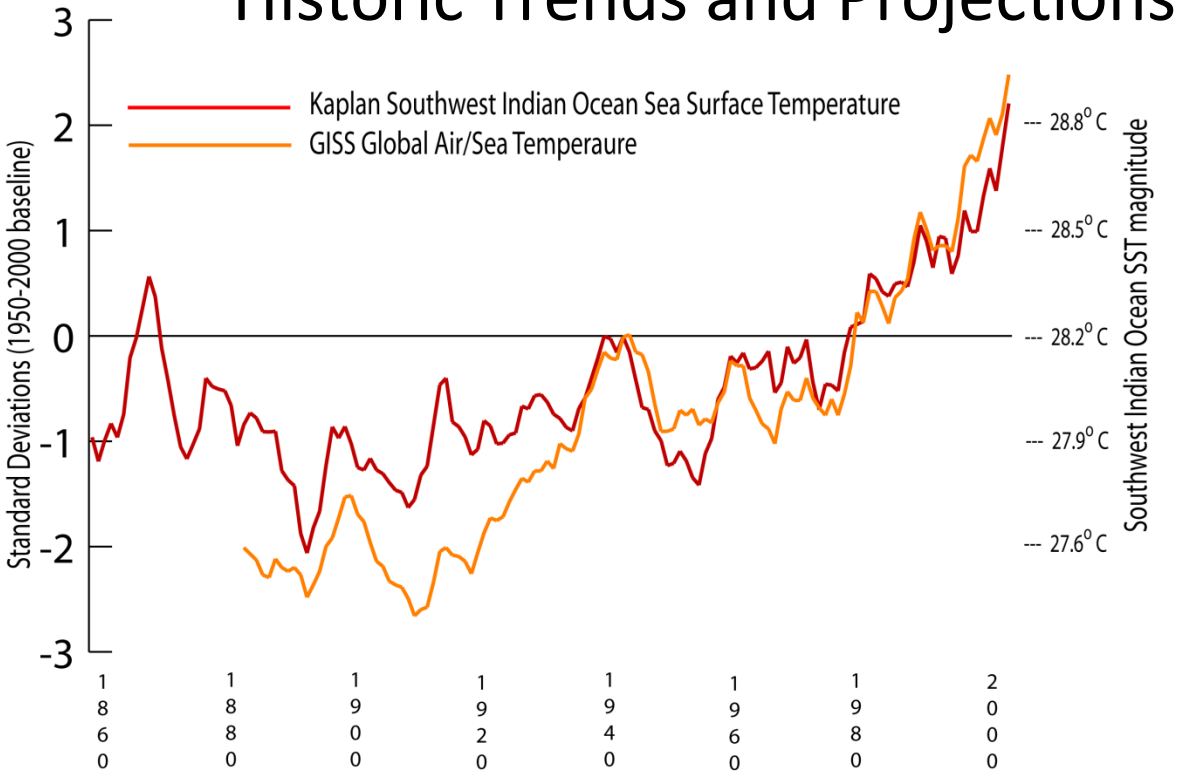
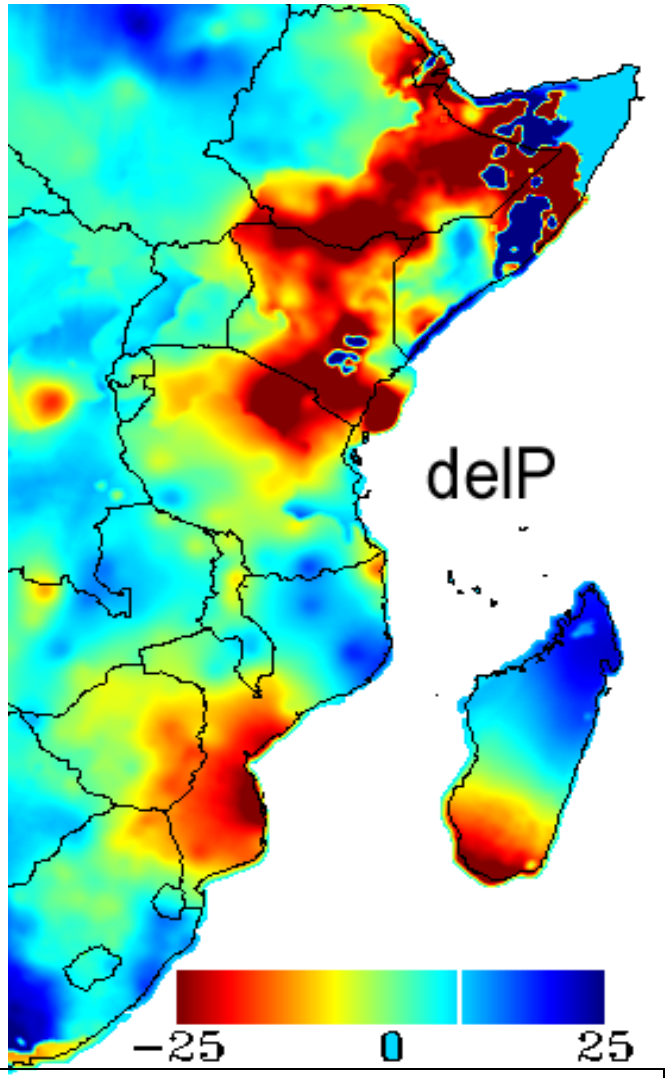
Historic Trends and Projections



20th Century Global Surface Temperatures and Indian Ocean SSTs Rising in Tandem (Same "hockey-stick" rise since 1980)



Anticipated change in rainfall (as percent)
More agricultural drought lies ahead

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Courtesy Jim Verdin USGS

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FEWS NET

A Climate Trend Analysis of Kenya—August 2010

Conclusions

- *Long rains in central Kenya have declined more than 100 millimeters since the mid-1970s. This decline is probably linked to warming in the Indian Ocean, and seems likely to continue.*
- *The observed drying tendency is the opposite predicted by the 4th Intergovernmental Panel on Climate Change (IPCC) assessment.*
- *A warming of more than 1° Celsius may exacerbate drying impacts, especially in lowland areas.*
- *The drying trends could particularly impact densely populated areas to the east, north, and north-west of Nairobi.*
- *Critical surplus crop growing areas in Central Kenya are threatened, and the amount of prime arable land could diminish substantially.*

Observed Drying Trends

This brief report draws from a multi-year effort by the United States Agency for International Development's Famine Early Warning System Network (FEWS NET) to monitor and map rainfall and temperature trends over the last 50 years (1960–2009) in Kenya. Observations from seventy rainfall gauges and seventeen air temperature stations were analyzed for the long rains period, corresponding to March through June (MAMJ). The data were quality controlled, converted into 1960–2009 trend estimates, and interpolated using a rigorous geo-statistical technique (kriging). Kriging produces standard error estimates, and these can be used to assess the relative spatial accuracy of the identified trends. Dividing the trends by the associated errors allows us to identify the relative certainty of our estimates (Funk and others, 2005; Verdin and others, 2005; Brown and Funk, 2008; Funk and Verdin, 2009). Assuming that the same observed trends persist, regardless of whether or not these changes are due to anthropogenic or natural cyclical causes, these results can be extended to 2025, providing critical, and heretofore missing information about the types and locations of adaptation efforts that may be required to improve food security.

The analyses clearly indicate cohesive patterns of observed climate change during the 1960–2009 era in rainfall (fig. 1) and temperature data (fig. 2). Extending the observed 1960–2009 changes out until 2025, we find that large parts of Kenya will have experienced more than a 100 millimeter (mm) decline in long-season rainfall by that date. Evaluations of independent rainfall data sets produce similar results (Williams and Funk, 2010). For Kenya, the relative magnitude of the identified long-season rainfall declines is generally more than three times the associated standard errors (table 1, supplemental *map 1*). These decreases in rainfall were accompanied by significant increases in average air temperatures, with the MAMJ temperature increases generally being more than twice the interpolation standard errors (table 1, supplemental *map 2*). This 1° Celsius warming value can be compared to the typical inter-annual standard deviation of MAMJ station temperatures, about 0.6° Celsius.

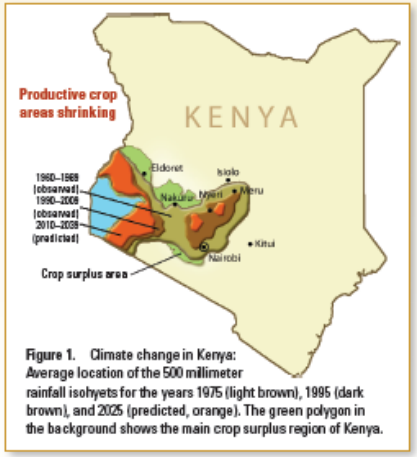

Figure 1. Climate change in Kenya: Average location of the 500 millimeter rainfall isohyets for the years 1975 (light brown), 1995 (dark brown), and 2025 (predicted, orange). The green polygon in the background shows the main crop surplus region of Kenya.

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Fact Sheet 2010–3074
August 2010

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FEWS NET

Using Observed Warming to Identify Hazards to Mozambique Maize Production

Conclusions

- *Recent (2011) analysis indicates that 30 years of substantial warming has increased temperatures during the primary growing season in central Mozambique by ~1.5 degrees Celsius.*
- *The warming is affecting the maize crop's phenology by causing an onset of flowering 4 days earlier and a 5 to 7 percent decline in total time to plant maturation.*
- *Warmer temperatures earlier in the season threaten maize yields by exposing the plant at sensitive crop phases to increased heat and drought, and shortening the crop's growth cycle, thus reducing the size of the plant and the weight of its grains.*
- *Continued warming could increase the risk of these hazards and affect crop production, regardless of any changes in rainfall.*

New Perspectives on Crop Yield Constraints because of Climate Change

Climate change impact assessments usually focus on changes to precipitation because most global food production is from rainfed cropping systems; however, other aspects of climate change may affect crop growth and potential yields.

A recent (2011) study by the University of California, Santa Barbara (UCSB) Climate Hazards Group, determined that climate change may be affecting Mozambique's primary food crop in a usually overlooked, but potentially significant way (Harrison and others, 2011). The study focused on the direct relation between maize crop development and growing season temperature. It determined that warming during the past three decades in Mozambique may be causing more frequent crop stress and yield reductions in that country's maize crop, independent of any changes occurring in rainfall. This report summarizes the findings and conclusions of that study.

Assessing Changes in Temperature and Maize Development in Mozambique

The Harrison (2011) study analyzed historical changes in air temperature in Mozambique between 1979 and 2008, and collected data that relate the duration of specific maize plant growth phases to differing temperatures. Mozambique-specific planting dates were estimated using the U.S. Geological Survey (USGS) Geospatial Water Requirement Satisfaction Index (GeoWRSI.) The following changes in maize growth stages were assessed at nine locations (fig. 1):

- number of days from planting to flowering;
- duration of the reproductive period (flowering to maturity, days);
- total growth duration (planting to maturity, days);
- minimum, maximum, and average temperature during each of these periods, in degrees Celsius (°C); and
- 90th percentile maximum temperature during the reproductive period (°C).

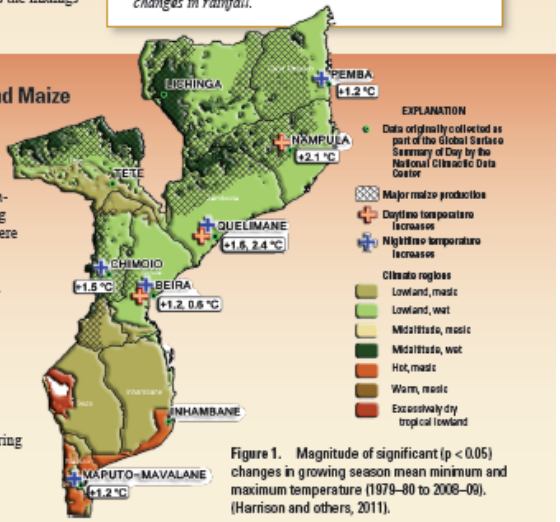

Figure 1. Magnitude of significant ($p < 0.05$) changes in growing season mean minimum and maximum temperature (1979–80 to 2008–09). (Harrison and others, 2011).

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Fact Sheet 2011–3110
September 2011

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La Nina and Food Security in East Africa

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EXECUTIVE BRIEF: La Niña and Food Security in East Africa **August 2010**

Key messages

- A La Niña event has been declared based on the cooling of sea surface temperatures (SST) in the central Pacific Ocean. La Niña events are associated with drier-than-normal conditions during the October-December rainy season in the eastern sector of East Africa, and with wetter-than-normal conditions in the western and northern sector (Sudan, western Ethiopia, and western parts of Kenya). La Niña events can also result in poor March-May rains in the eastern sector of the region.

- The main areas of concern are those that depend on the short rains for crop and pasture production, including Somalia, the northeast pastoral and southeastern marginal agricultural areas of Kenya, the Somali region of Ethiopia, and northeastern Tanzania. In pastoral areas, below-average rains could lead to rapid depletion of resources, livestock clustering in permanent water points and limited dry-season grazing areas, and reduced livestock productivity and value, thereby gradually reversing substantial recent food security gains. In cropping areas, poor October to December rains would negatively affect agricultural labor opportunities, food availability, prices, and income beginning in February 2010 with the short rains harvest.

- The impacts of a La Niña event in the northern and western sector of the region are likely to be less severe. Above-average rains could improve crop and livestock conditions, though they could also increase the risks of flooding, soil erosion, and seasonal disease prevalence.

- Although the La Niña event is considered to be moderate at this time, the severity of the event will depend on the response of sea surface temperatures in the Indian Ocean. If the warming trend in Indian Ocean SSTs continues, it will moderate the precipitation impacts of the La Niña in East Africa, whereas cooling temperatures could exacerbate the trends described above. FEWS NET will issue a follow-up brief pending the outcome of the regional Climate Outlook Forum.

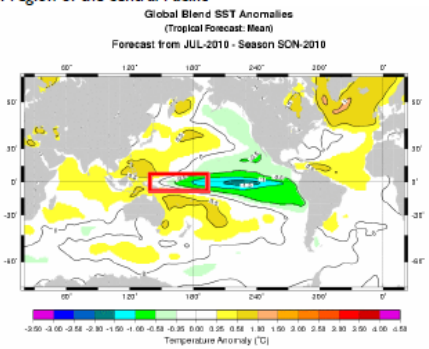
Understanding La Niña

A La Niña event has been officially declared by both the World Meteorological Organization (WMO) and the National Oceanic and Atmospheric Administration Climate Prediction Center (NOAA/CPC). La Niña events are operationally defined using the Oceanic Niño Index (ONI), the three-month running mean values of sea surface temperature (SST) departures from average in the Niño 3.4 region of the central Pacific (Figure1). NOAA defines La Niña as the condition whereby the ONI is less than or equal to -0.5 degrees Celsius in the Niño 3.4 region.

Current conditions in the Niño 3.4 region indicate rapid cooling of SSTs. Various SST model forecasts indicate that, based on expected SSTs of -1 to -1.5 degrees, a moderate La Niña event is likely to begin in August 2010 and last for 9 to 12 months.

La Niña events are generally associated with drier-than-

Figure 1. Sea Surface Temperature Anomalies in the Niño 3.4 region of the central Pacific



Source: NOAA

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La Nina and Food Security in East Africa

- September 2010 GHACOF confirmed La Nina outlook
- November 2, 2010 EAST AFRICA Food Security Alert

"…a worse than usual JFM lean season…"

- February 23, 2011 EAST AFRICA Food Security Alert

"Large-scale emergency assistance to address current food insecurity is needed.."

- March 15, 2011 EAST AFRICA Food Security Alert

"Below-average March to May rains forecast in the Eastern Horn – current crisis likely to worsen"

- May 6, 2011 EAST AFRICA Food Security Alert

"conditions in the pastoral areas in particular are moving toward the 'worst case scenario' identified by FEWS NET in the March 15 East Africa Food Security Alert"

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Courtesy Jim Verdin USGS

FEWS NET FAMINE EARLY WARNING SYSTEMS NETWORK

La Nina and Food Security in East Africa

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EAST AFRICA Food Security Alert

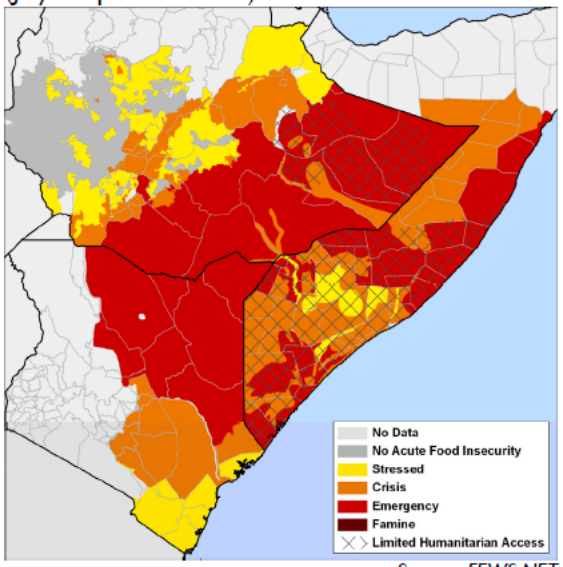
June 7, 2011

Food security emergency continues in the eastern Horn; humanitarian response inadequate

The eastern Horn of Africa has experienced two consecutive seasons of significantly below-average rainfall, resulting in one of the driest years since 1995. Crops have failed, substantial livestock mortality has occurred, and local cereal prices are very high. More than seven million people in the sub-region need humanitarian assistance, and emergency levels of acute malnutrition are widespread. **This is the most severe food security emergency in the world today, and the current humanitarian response is inadequate to prevent further deterioration**.

Following a complete failure of the 2010 October-December rains and related harvests, the 2011 March-May rains began late and performed erratically. In some areas of northern Kenya and southern Somalia, rainfall was less than 30 percent of the 1995-2010 average. Excess livestock mortality of 15-30 percent has been reported across the region, with mortality levels as high as 40-60 percent in localized areas, especially for cattle and sheep. Staple cereal prices remain much higher than last year and are approaching or have exceeded record levels. In southern Somalia, red sorghum prices have risen up to 240 percent over the last year. The combination of extremely high food prices and average to below-average livestock prices and wages has substantially eroded purchasing power in pastoral, cropping, and urban areas. In Juba region of Somalia, for example, the value of one cow plummeted from 430 kg to 161 kg of maize between May 2010 and May 2011.

Figure 1. Most-likely food security outcomes (July - September 2011)



Source: *FEWS NET*

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AMS Annual Meeting

January 23, 2012 – New Orleans, Louisiana

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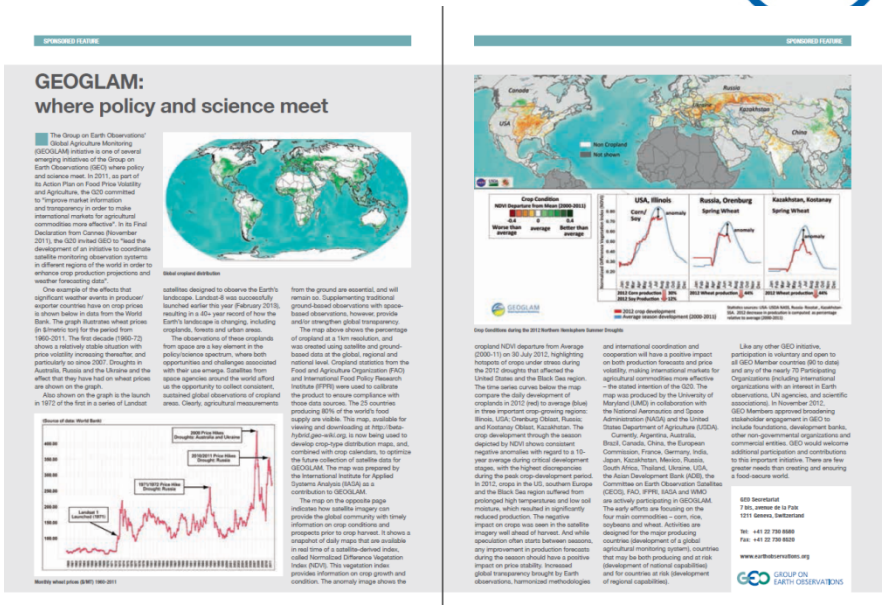
Courtesy Jim Verdin USGS

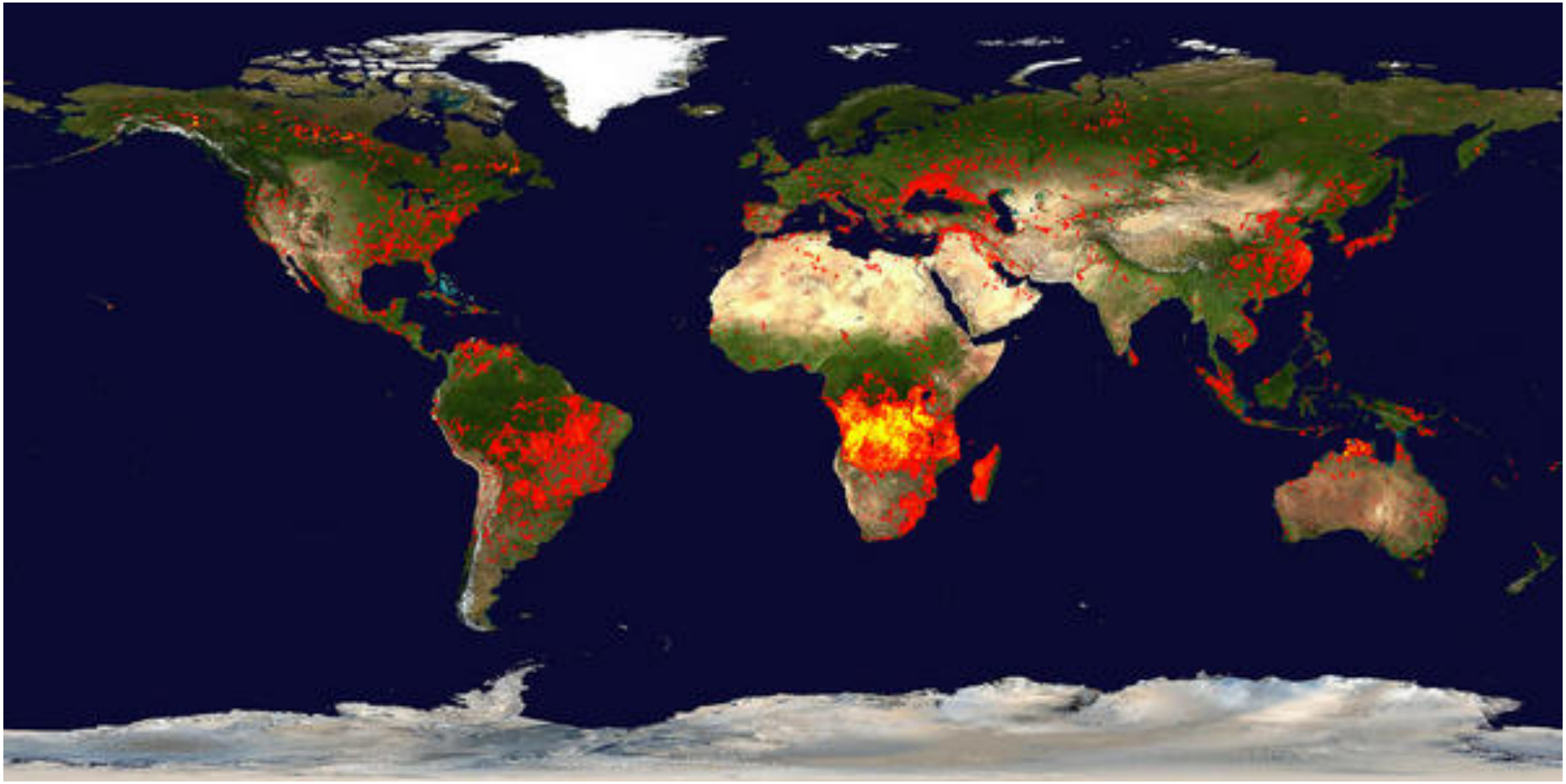
GROUP ON EARTH OBSERVATIONS



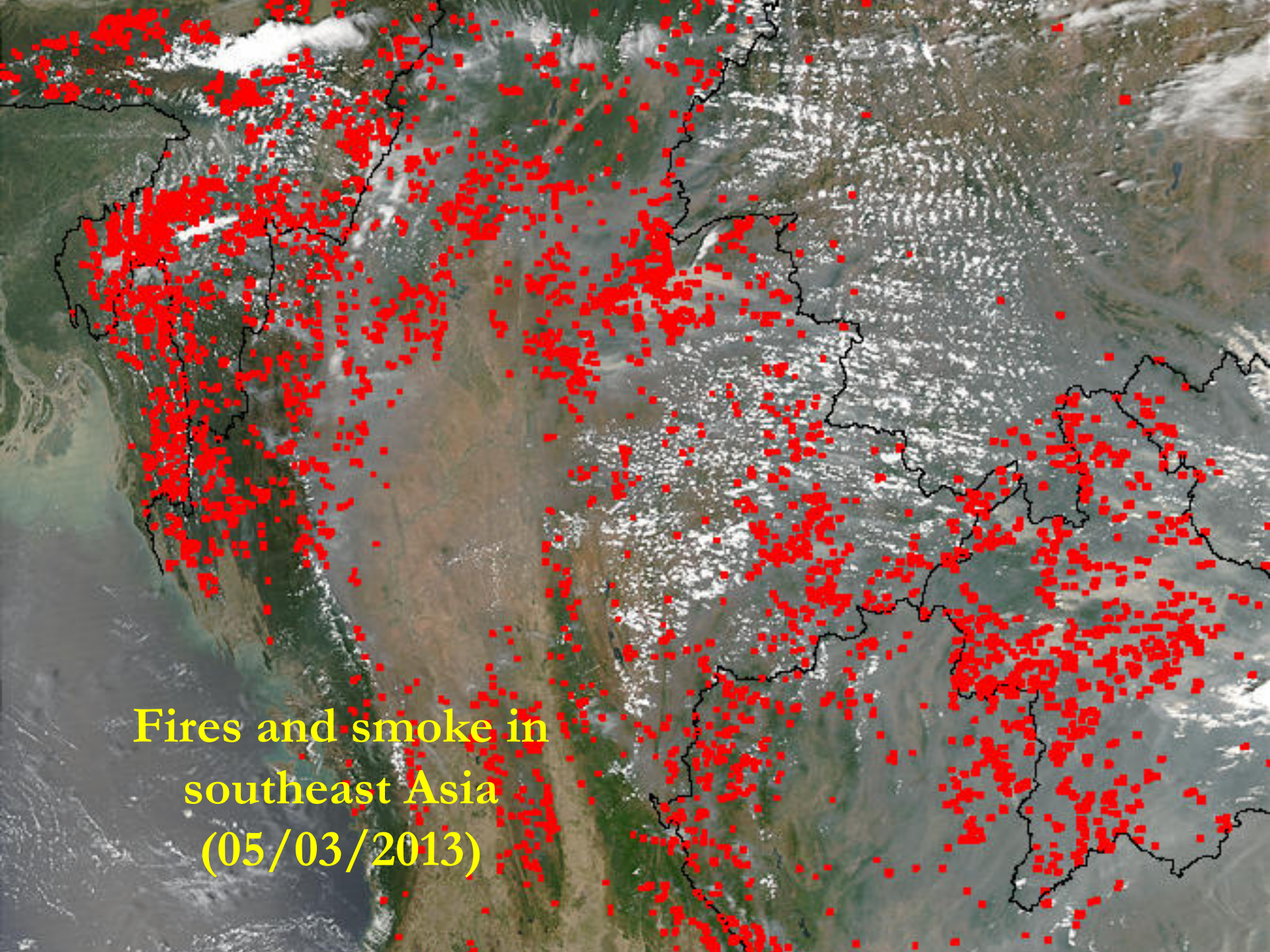
For GEOGLAM the international community of practice is ready – the work plan is well developed - the programs are getting the right level of policy mandate – now how does this translate into government agency commitments for improving operational systems, overcoming institutional barriers and implementing true international cooperation ?

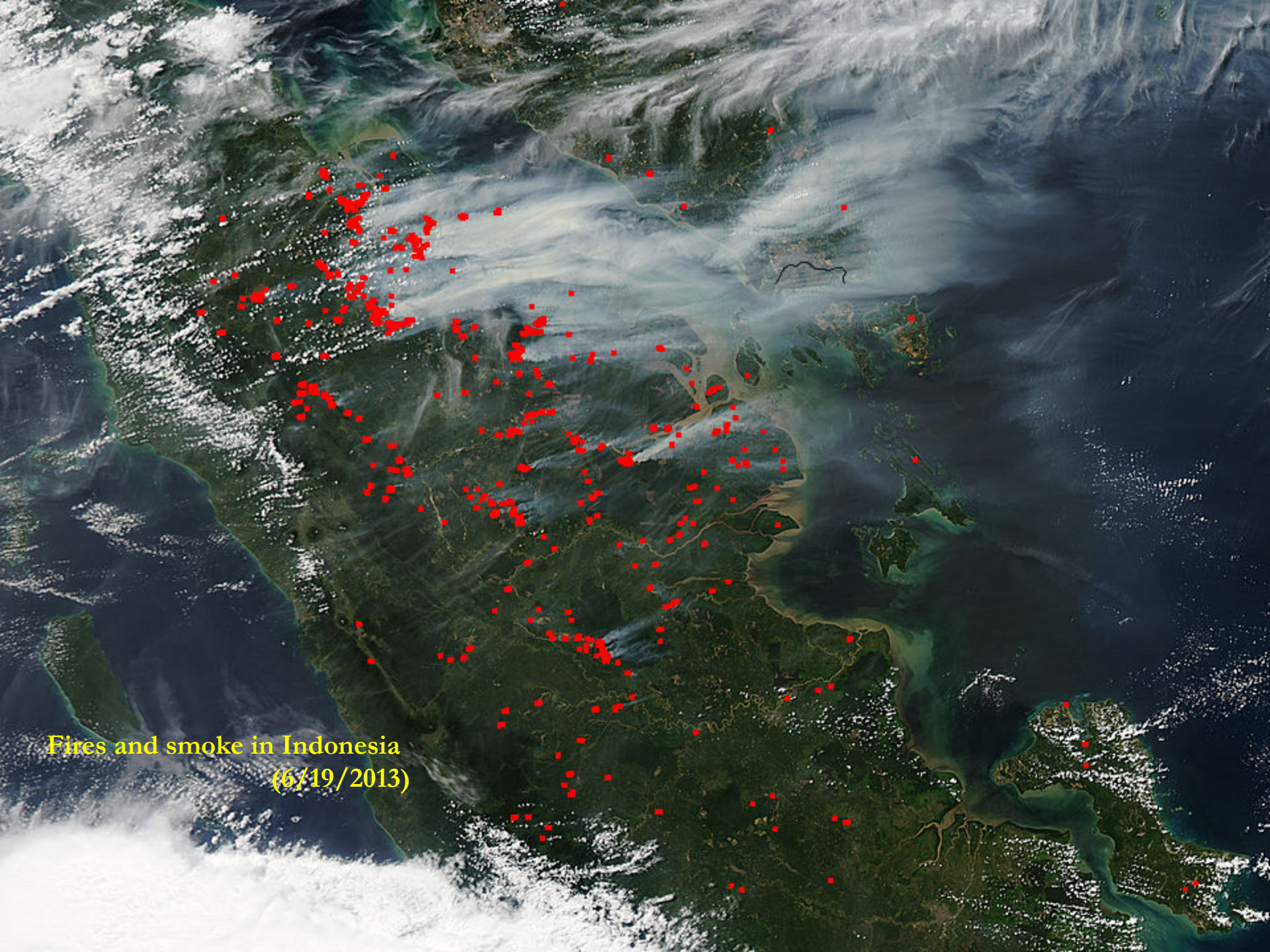
Satellite Detection of Fires Burning Last 10 days

MODIS Active Fire Detections (07/10/2013 - 07/19/2013)



Compiled Daily Observations taken by the NASA MODIS Satellite

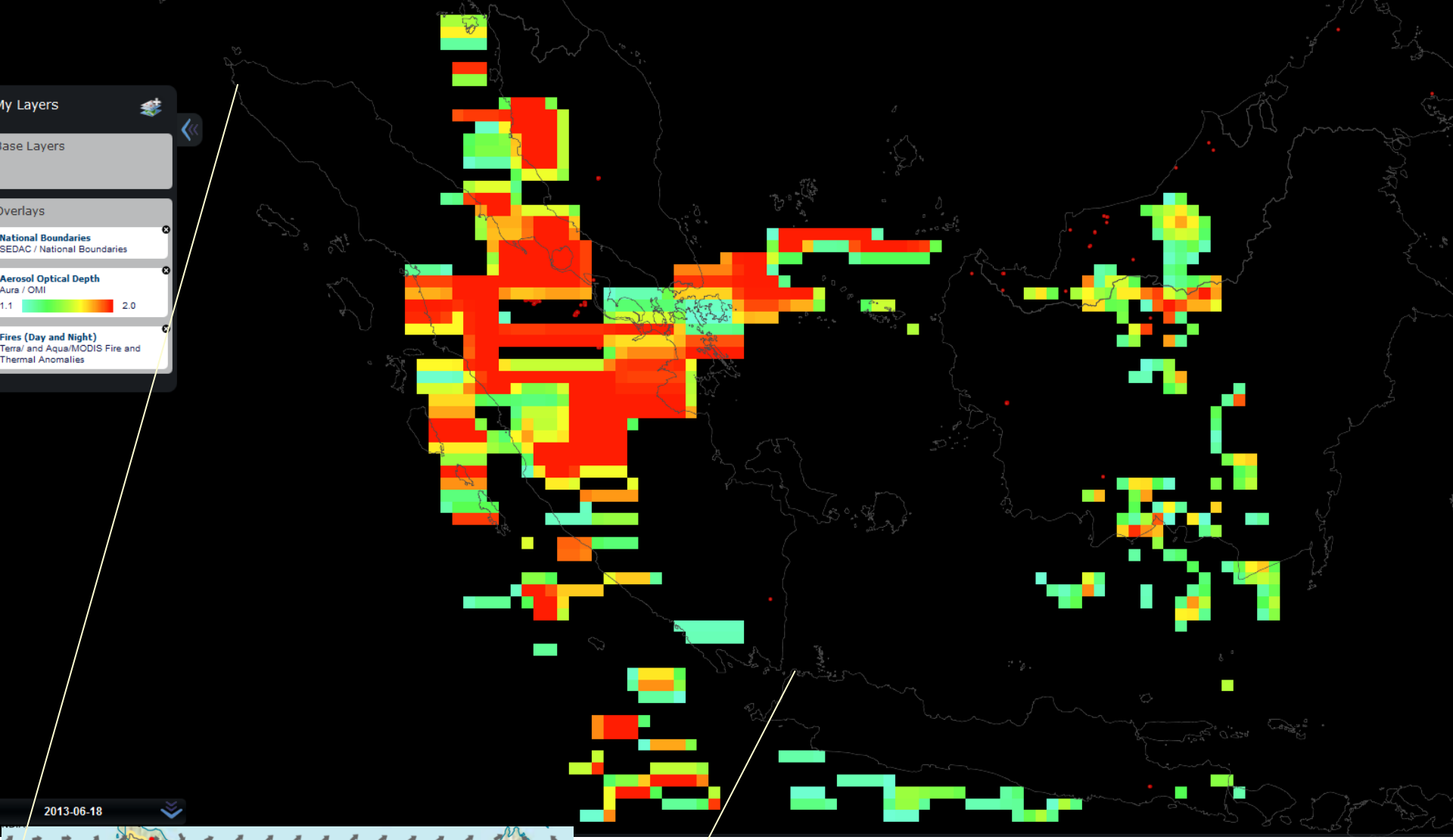

Fires and smoke in
southeast Asia
(05/03/2013)


Fires and smoke in Indonesia
(6/19/2013)

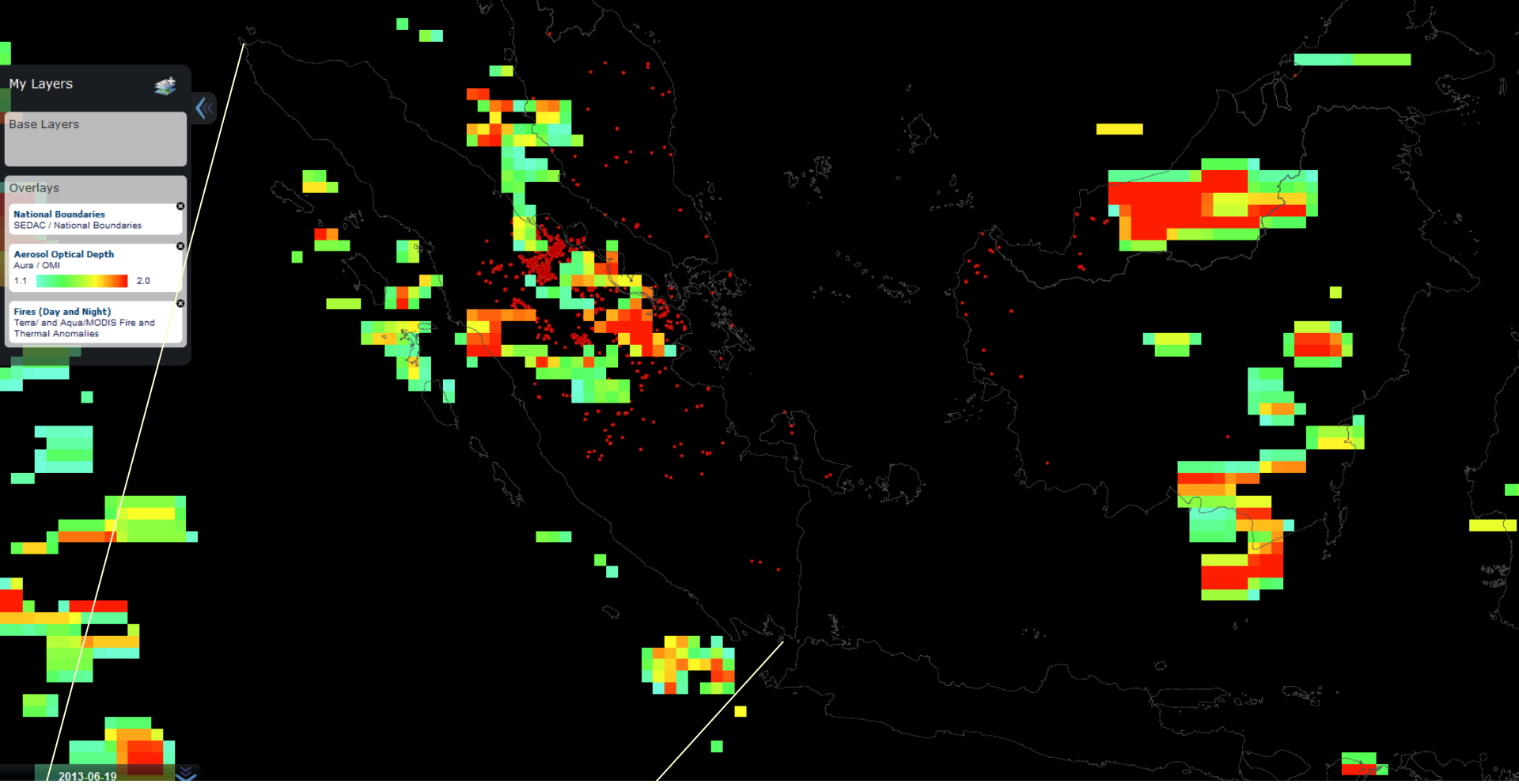
Fires, Riau Province, Sumatra, Indonesia, June 18, 2013

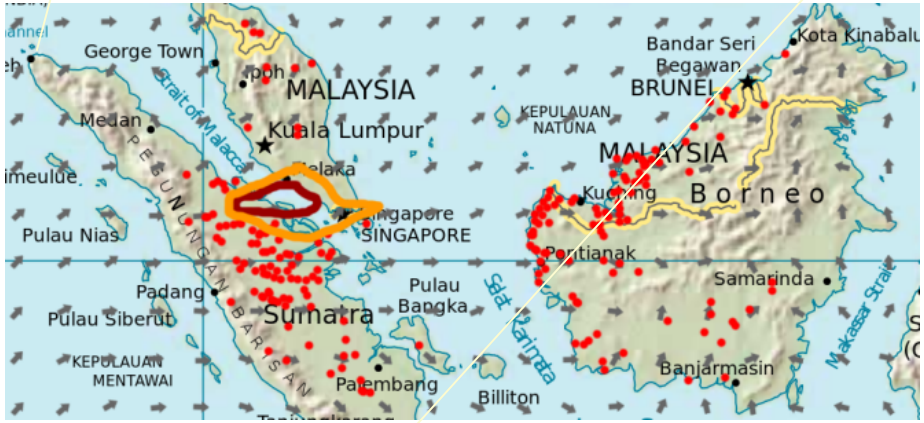
Haze in Singapore, June 20, 2013

China Env., Problems; Pollution

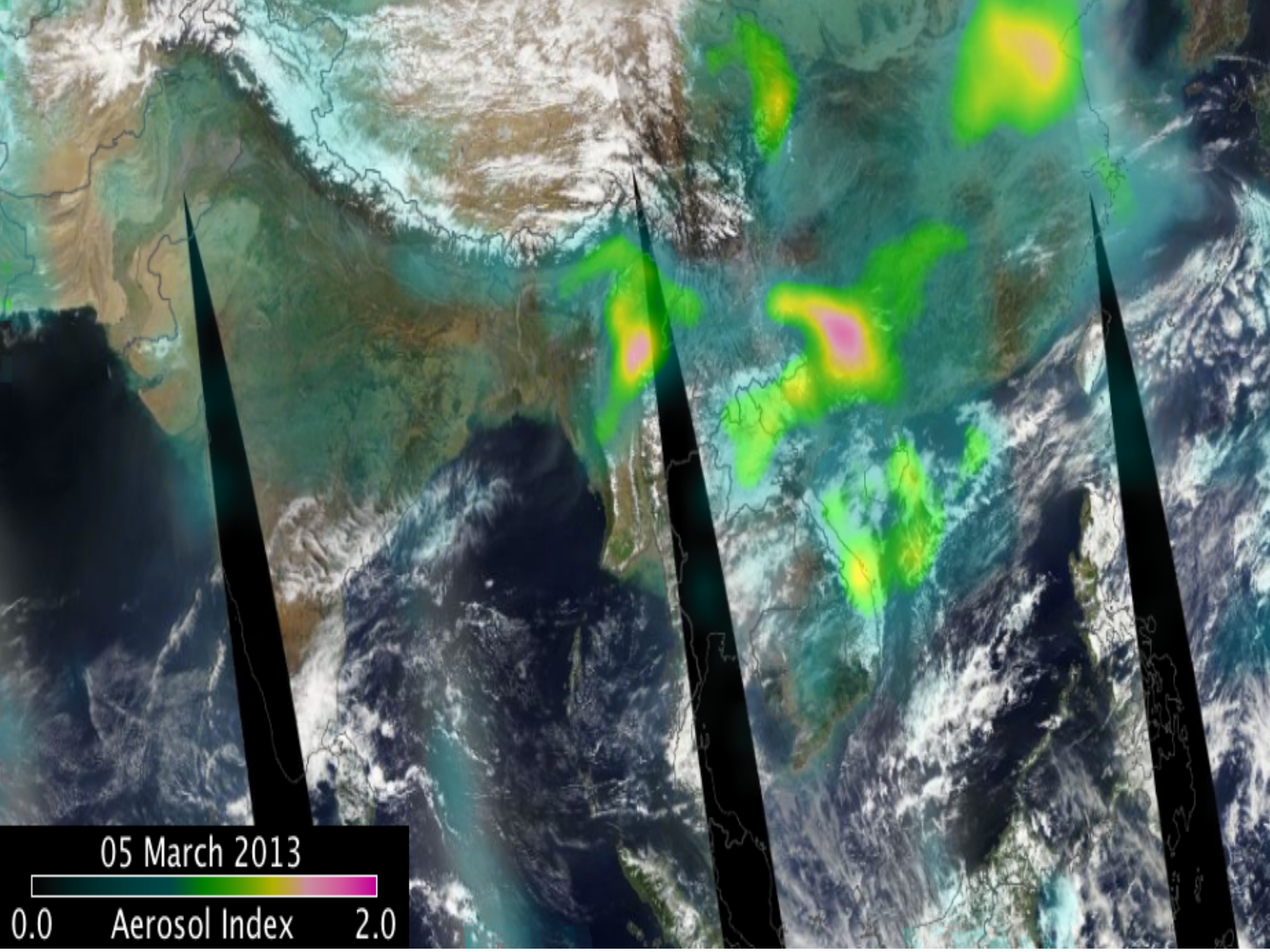


Aerosol optical depth – OMI (2013-06-18)





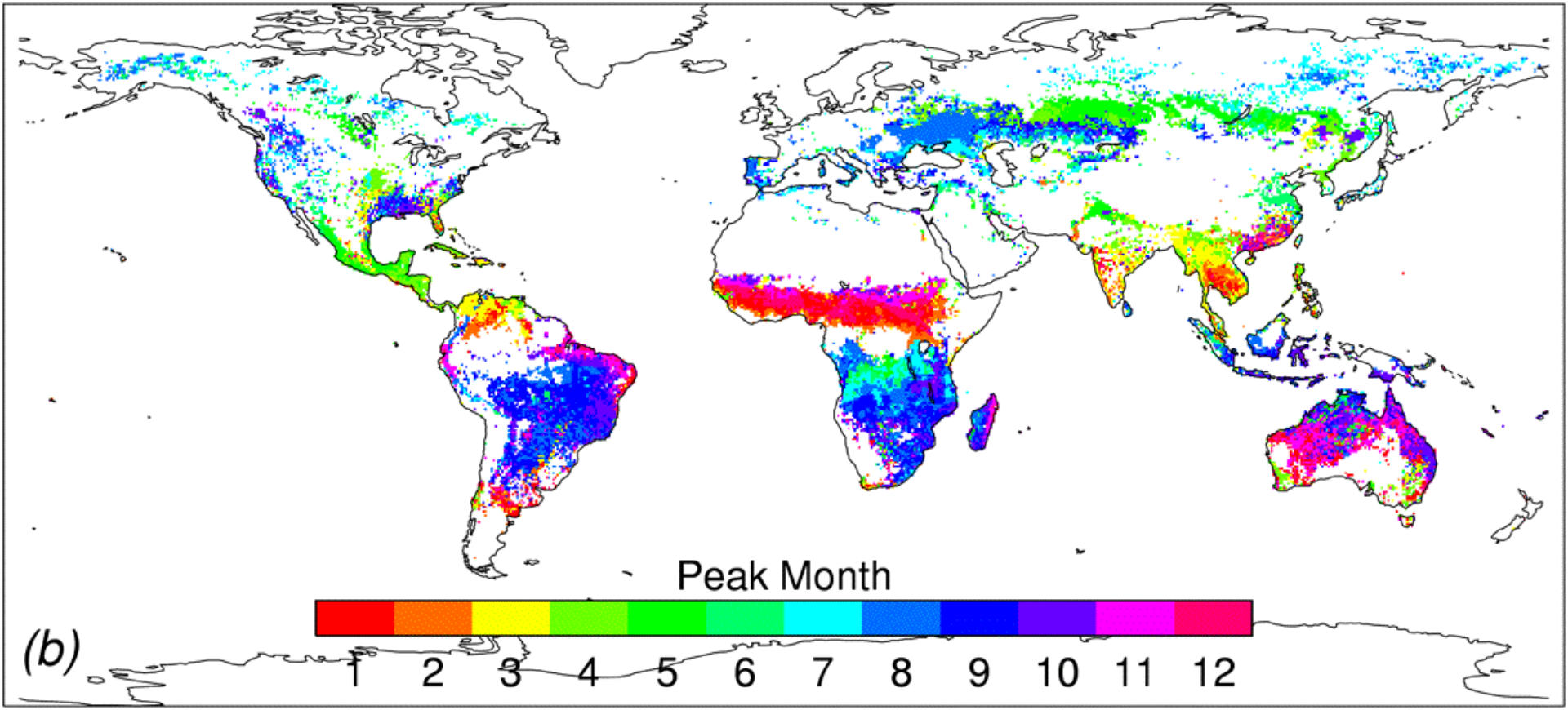
Aerosol optical depth–OMI (2013-06-19)


05 March 2013
0.0
Aerosol Index
2.0

ASEAN Agreement on Transboundary Haze Pollution

- The Agreement requires the Parties to the Agreement to:
- (i) cooperate in developing and implementing measures to prevent, monitor, and mitigate transboundary haze pollution by controlling sources of land and/or forest fires, development of monitoring, assessment and early warning systems, exchange of information and technology, and the provision of mutual assistance;
- (ii) respond promptly to a request for relevant information sought by a State or States that are or may be affected by such transboundary haze pollution, with a view to minimising the consequence of the transboundary haze pollution; and
- (iii) take legal, administrative and/ or other measures to implement their obligations under the Agreement.
- 9 SEA Countries, COP 6 Brunei 2010

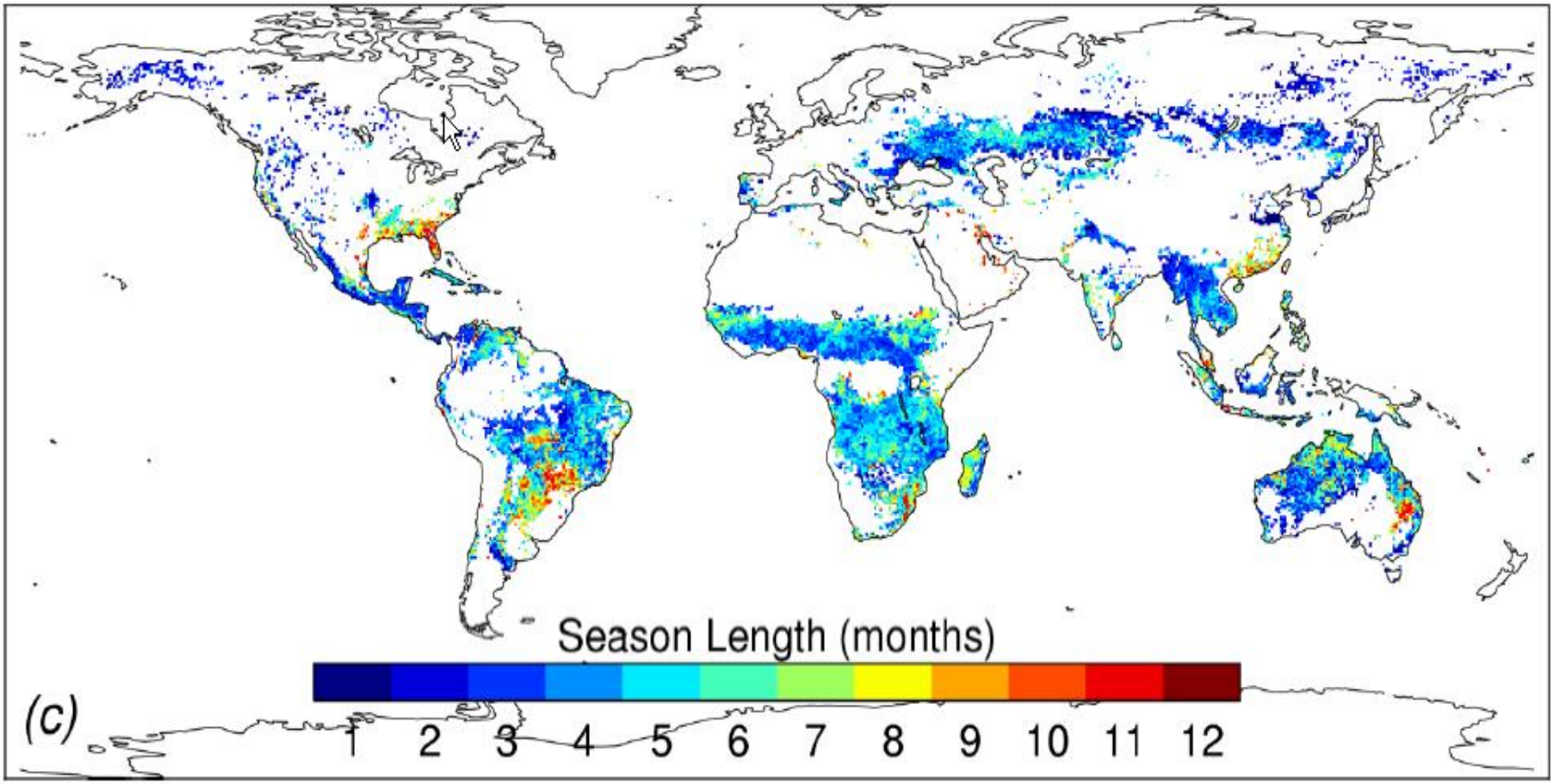
Time-series needed to develop a satellite-based Global Fire Regime Characterization



Mean Peak Fire Month (2000-2005)

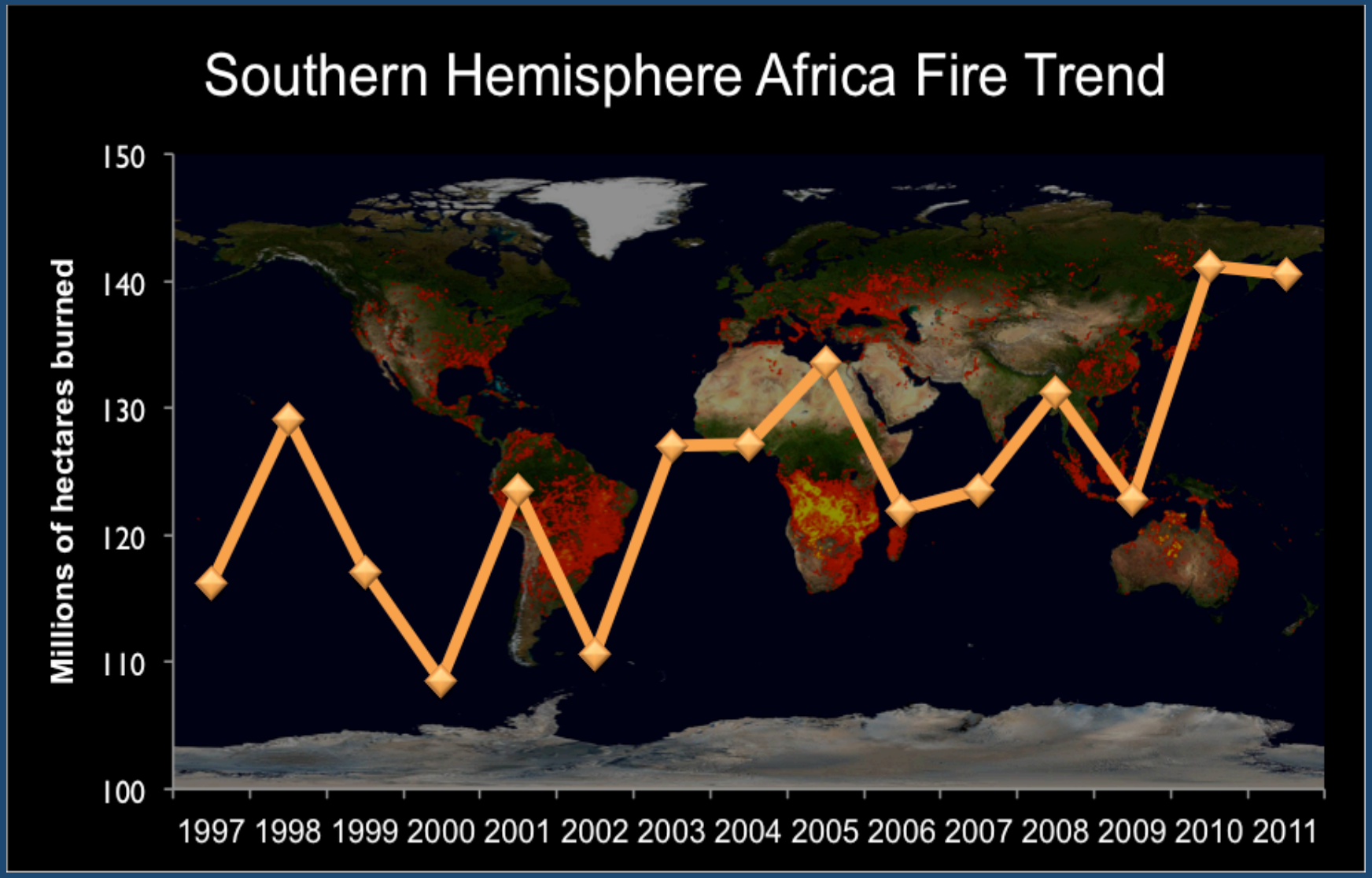
Giglio et al 2006

Starting to Characterize Global Fire



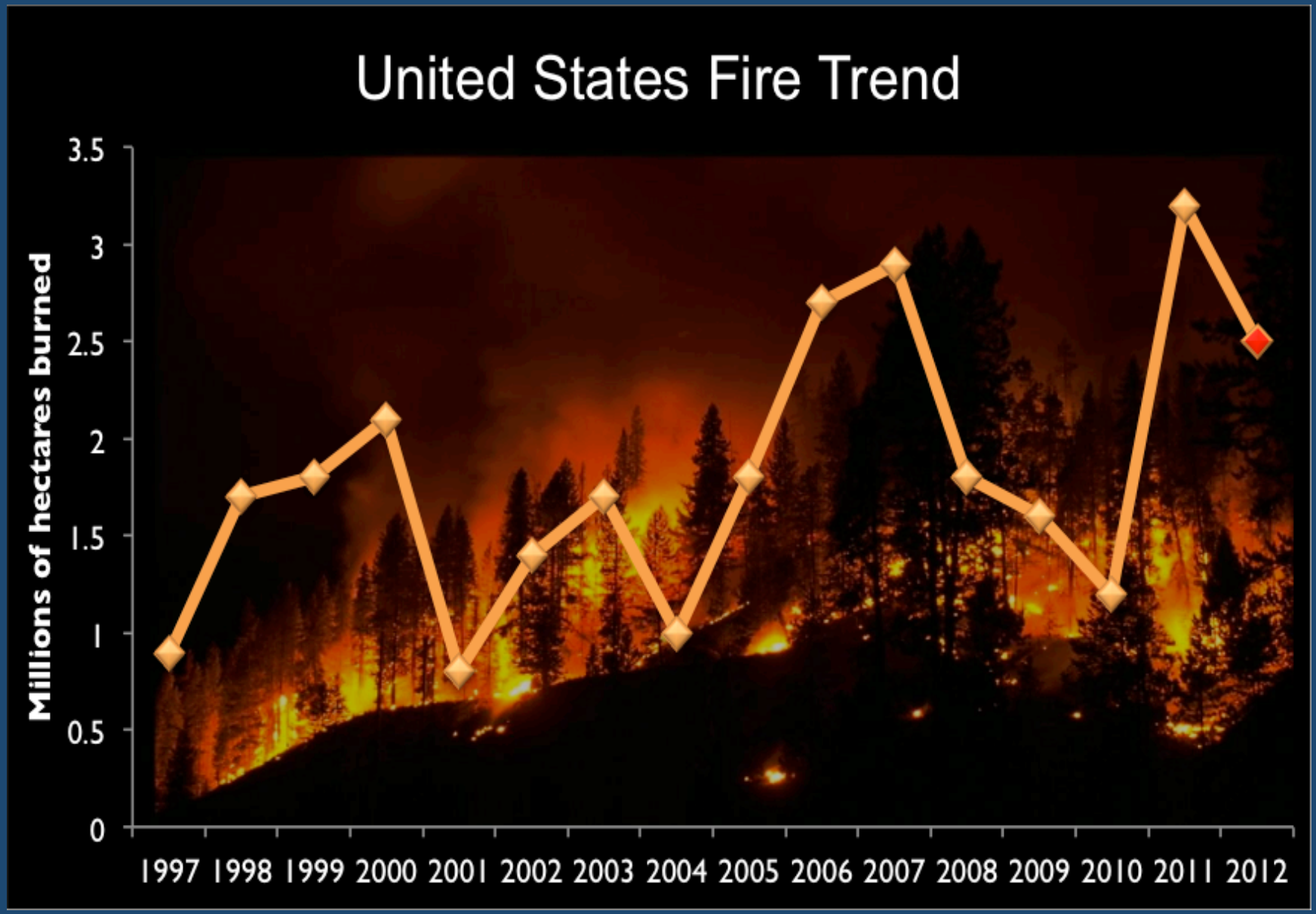
Season length from MODIS active fires (2000-2005)

Giglio et al., 2006, JGR



Burned area data from satellite-based Global Fire Emissions Database (GFED)

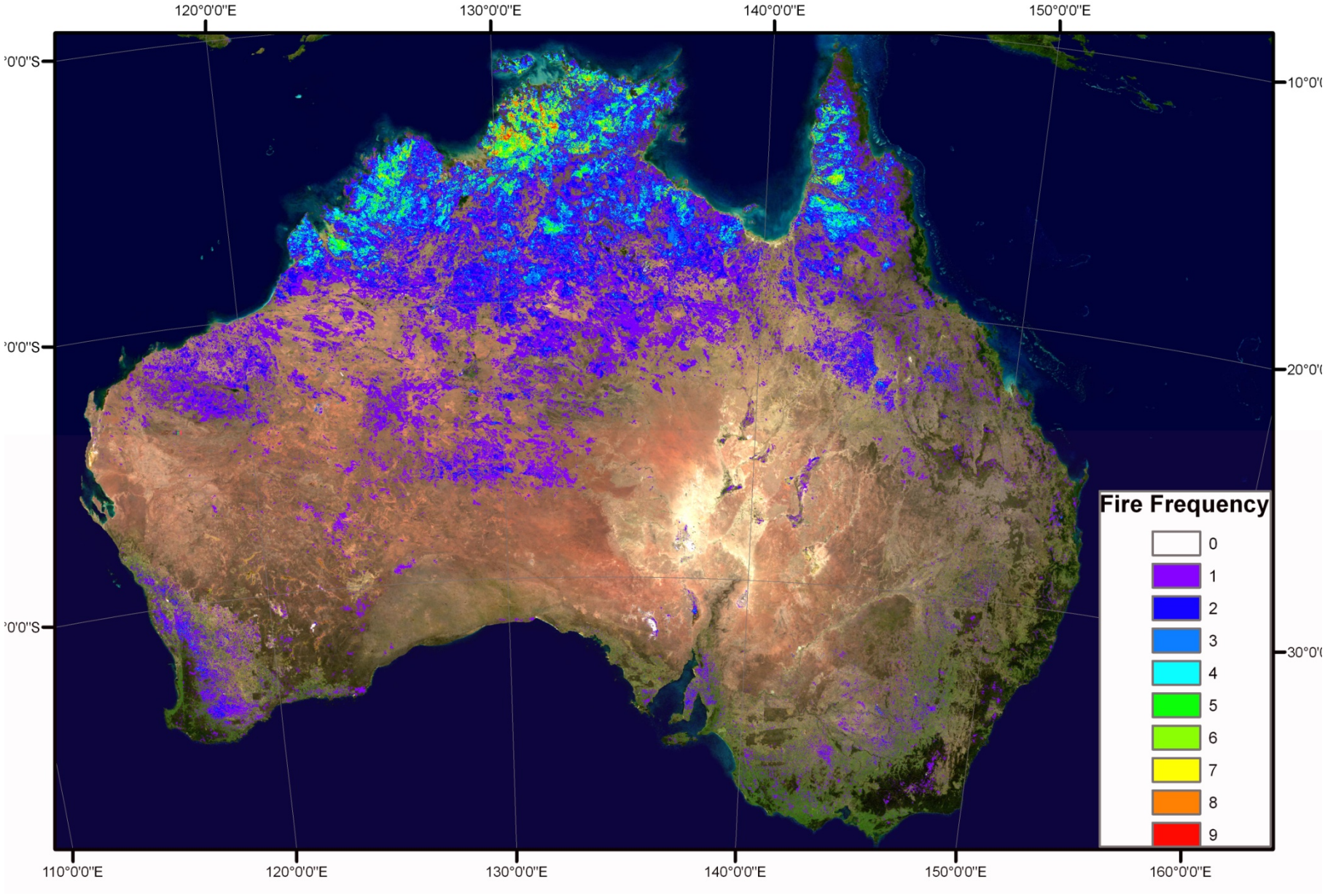
Giglio et al



2012 total was for January – August

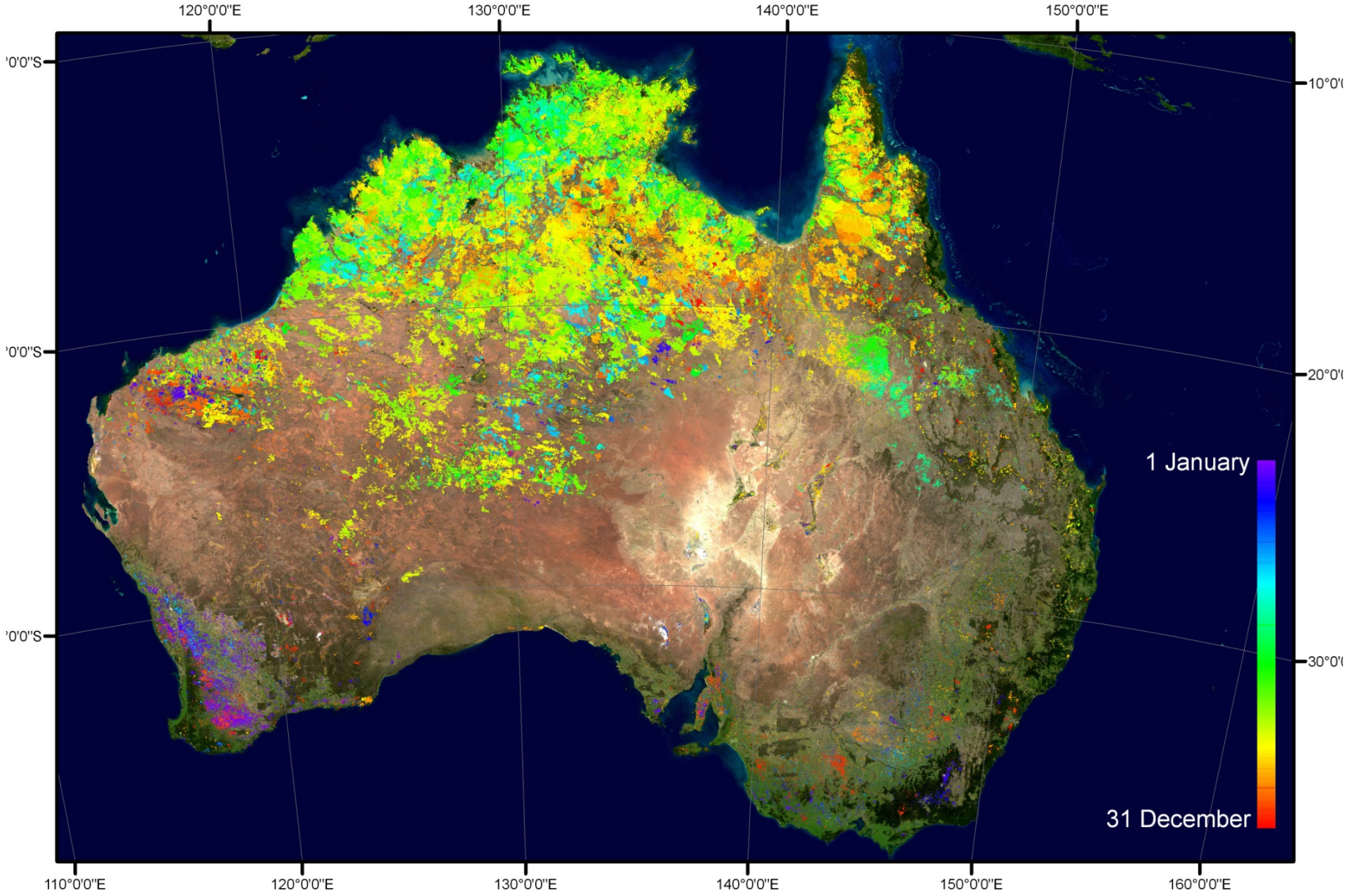
Giglio et al

MODIS Burned Area Frequency



Boschetti, Roy and Justice

MODIS Burned Area Median Date

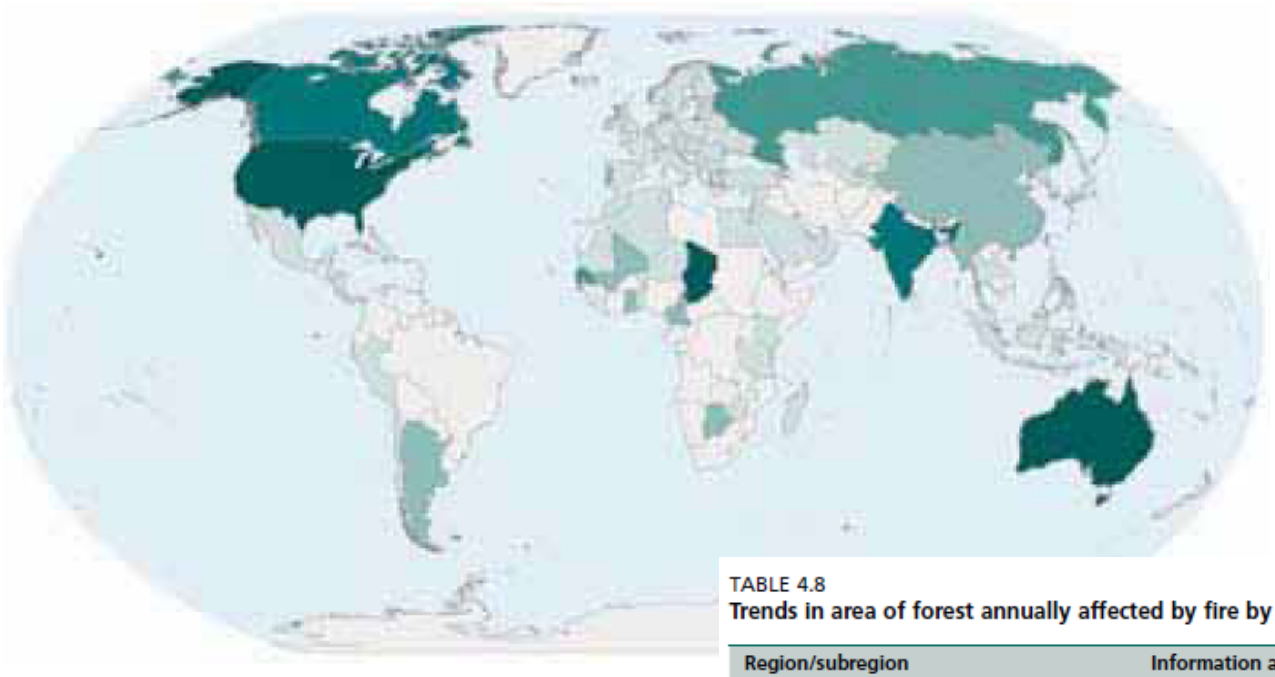


2000 - 2008

Boschetti, Roy and Justice

UN Forest Resource Assessment 2010

FIGURE 4.3
Average area of forest annually affected by fire by country, 2005



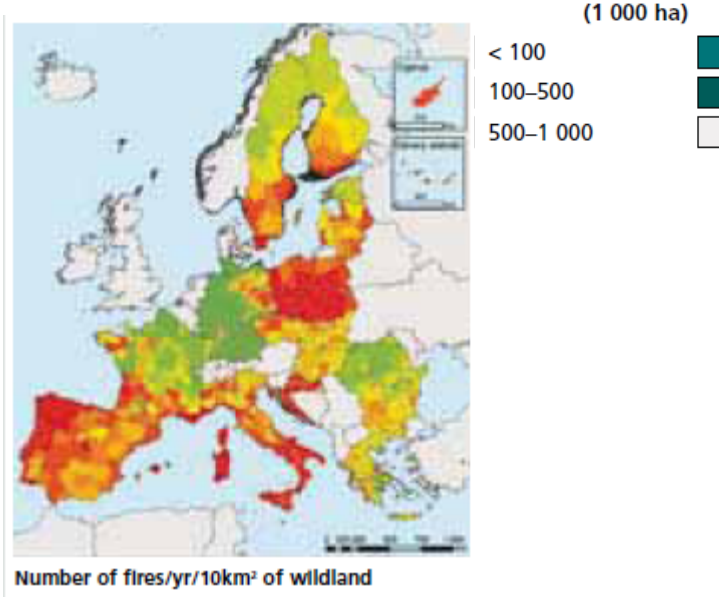
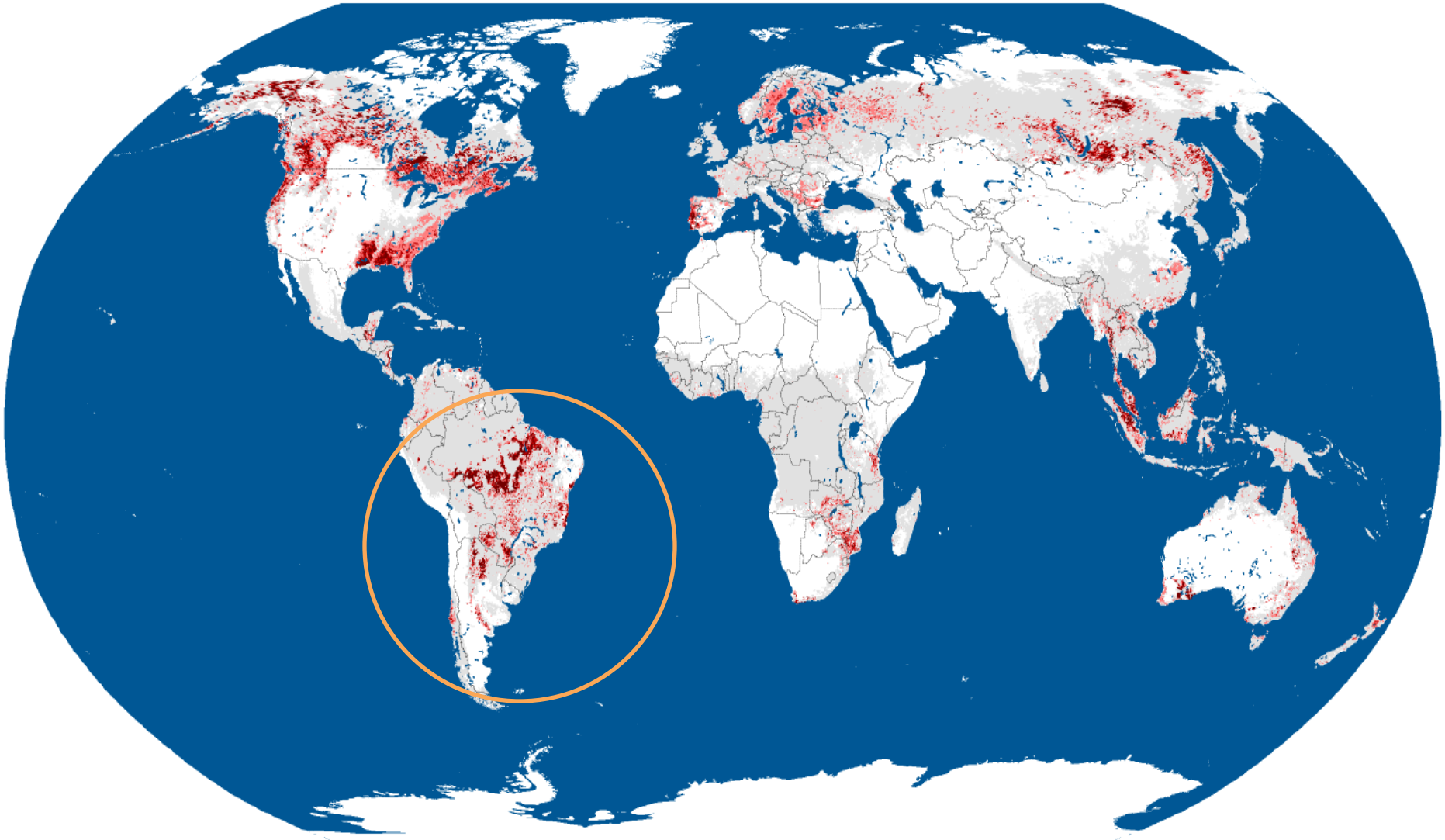


TABLE 4.8
Trends in area of forest annually affected by fire by region and subregion, 1990–2005

Region/subregion	Information availability		Area of forest affected by fire (1 000 ha)		
	Number of countries	% of total forest area	1990	2000	2005
Eastern and Southern Africa	6	25.0	88	50	53
Northern Africa	4	9.6	14	21	16
Western and Central Africa	4	9.2	12 141	8 462	7 157
Total Africa	**14**	**15.6**	**12 243**	**8 533**	**7 226**
East Asia	5	100.0	318	417	549
South and Southeast Asia	7	82.2	3 090	2 149	1 852
Western and Central Asia	13	48.7	19	79	47
Total Asia	**25**	**87.1**	**3 427**	**2 644**	**2 448**
Europe excl. Russian Federation	36	80.2	273	225	261
Total Europe	**37**	**96.2**	**896**	**1 387**	**1 252**
Caribbean	6	73.8	11	18	15
Central America	0	–	–	–	–
North America	4	100.0	2 781	3 112	3 437
Total North and Central America	**10**	**96.8**	**2 793**	**3 130**	**3 452**
Total Oceania	**5**	**4.2**	**0**	**0**	**0**
Total South America	**5**	**14.0**	**490**	**708**	**333**
World	**96**	**59.0**	**19 849**	**16 402**	**14 710**

Percent forest cover loss, 2000 to 2005

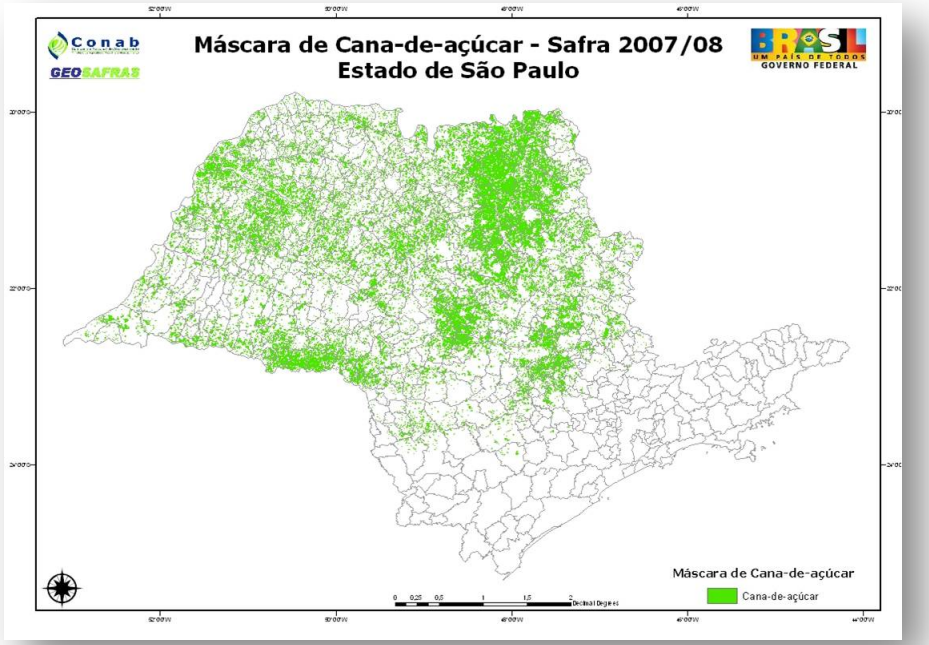
Time Series for Monitoring Forest Change

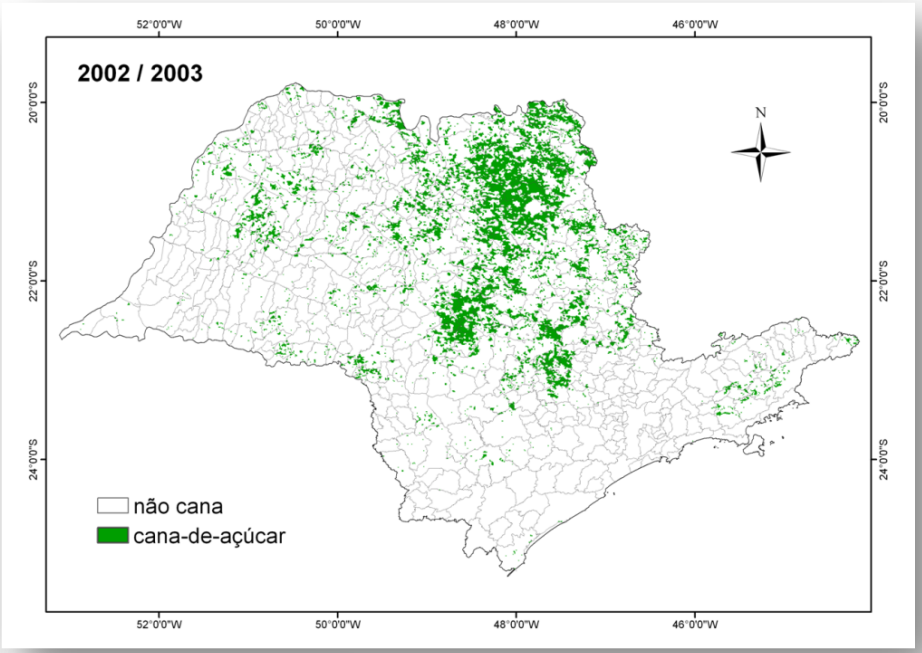


0 - 1.5% 1.5 - 5% 5 - 10% >10%

Hansen et al

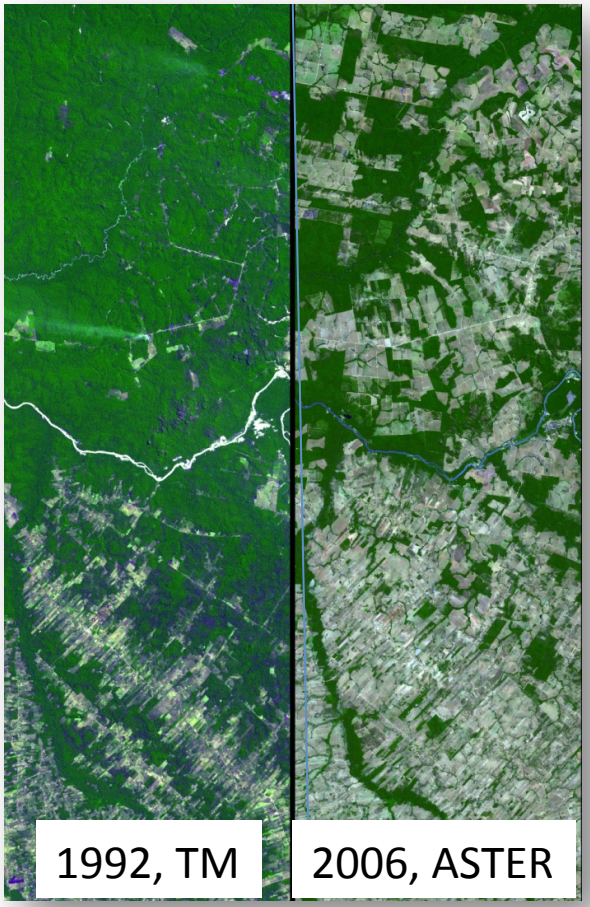
Sugarcane Expansion (Ethanol), Brazil

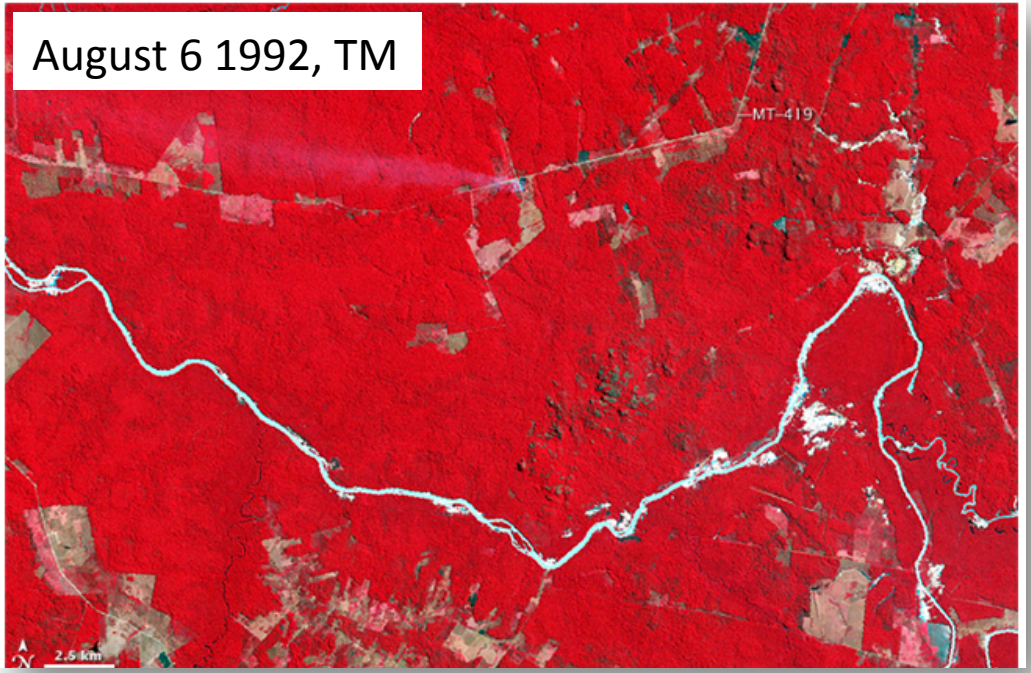


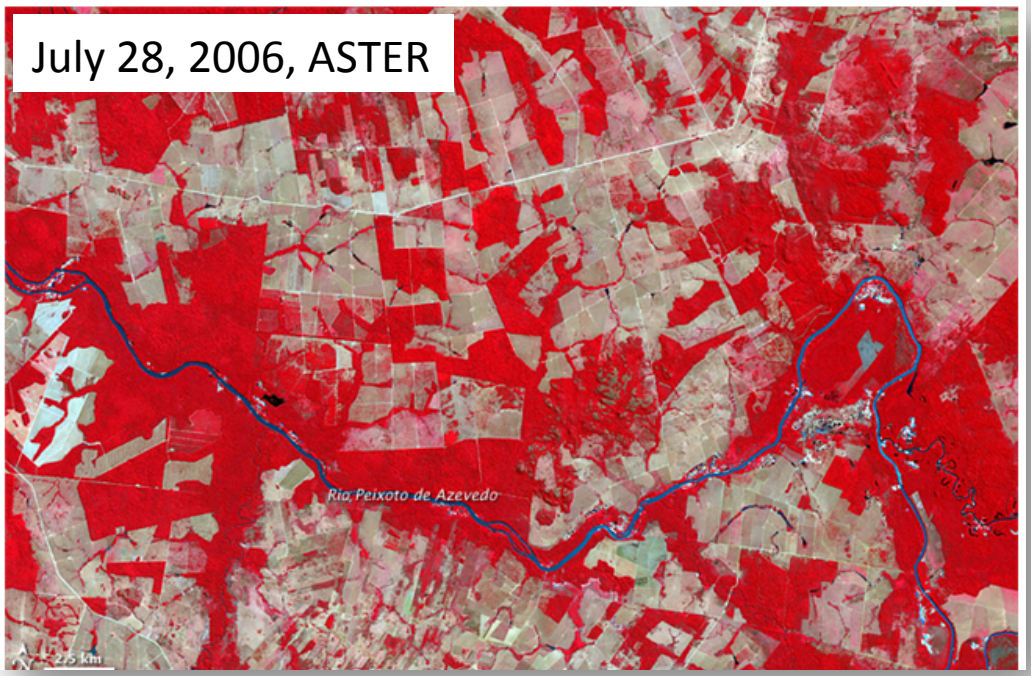


J. Rocha Conab

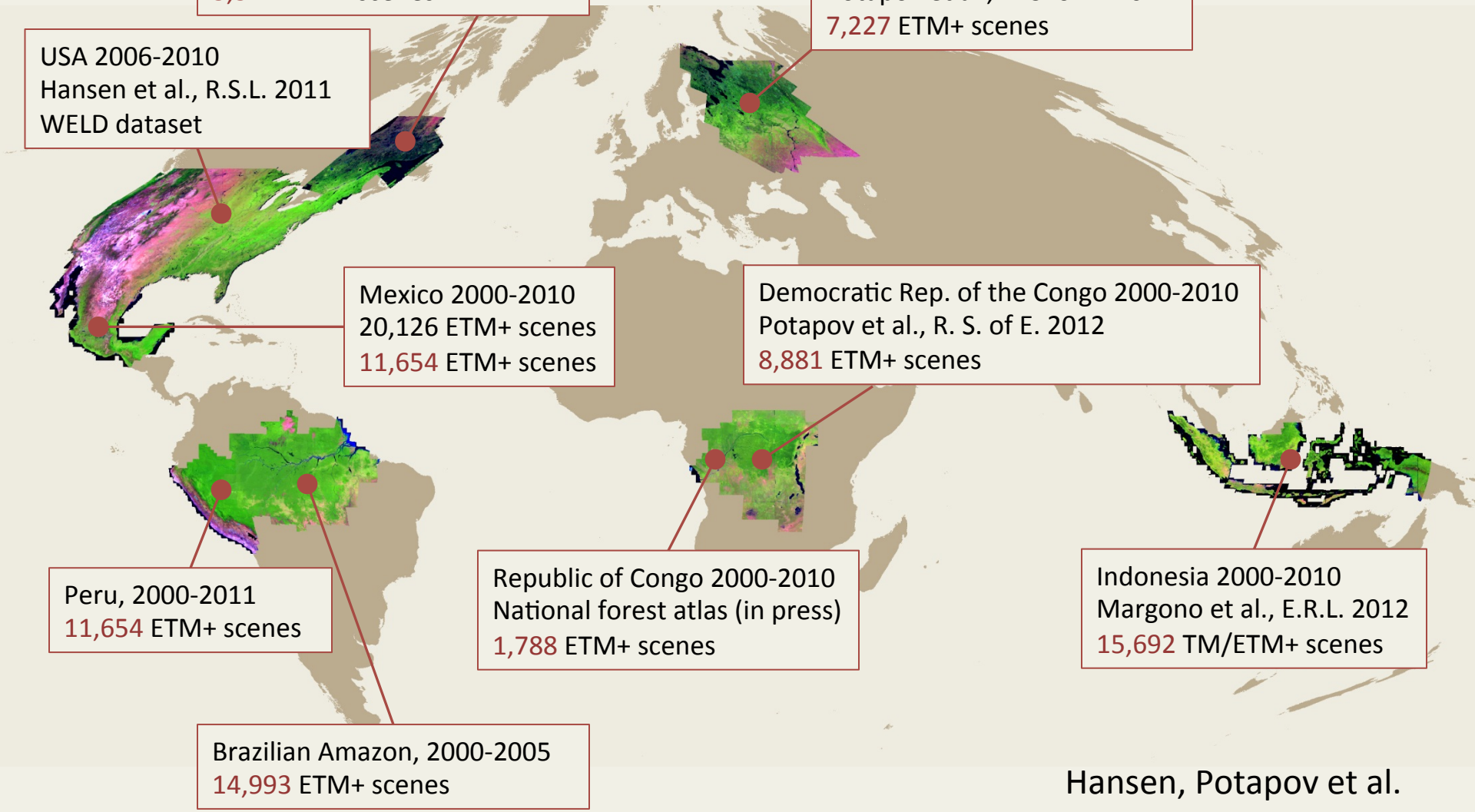
Soybean Expansion in Mato Grosso, Brazil







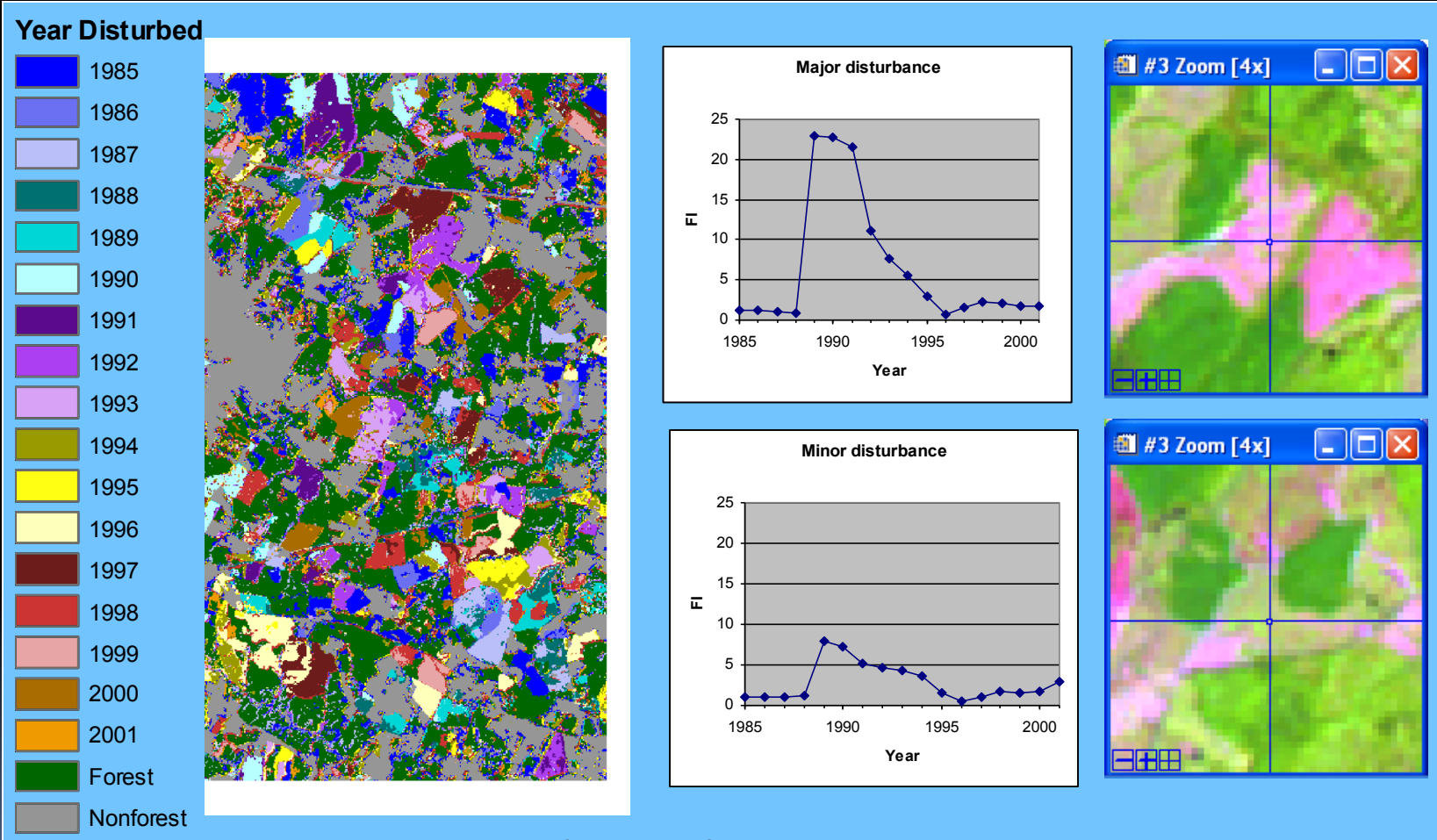
National and regional forest cover change mapping projects



Hansen, Potapov et al.

UNIVERSITY OF MARYLAND

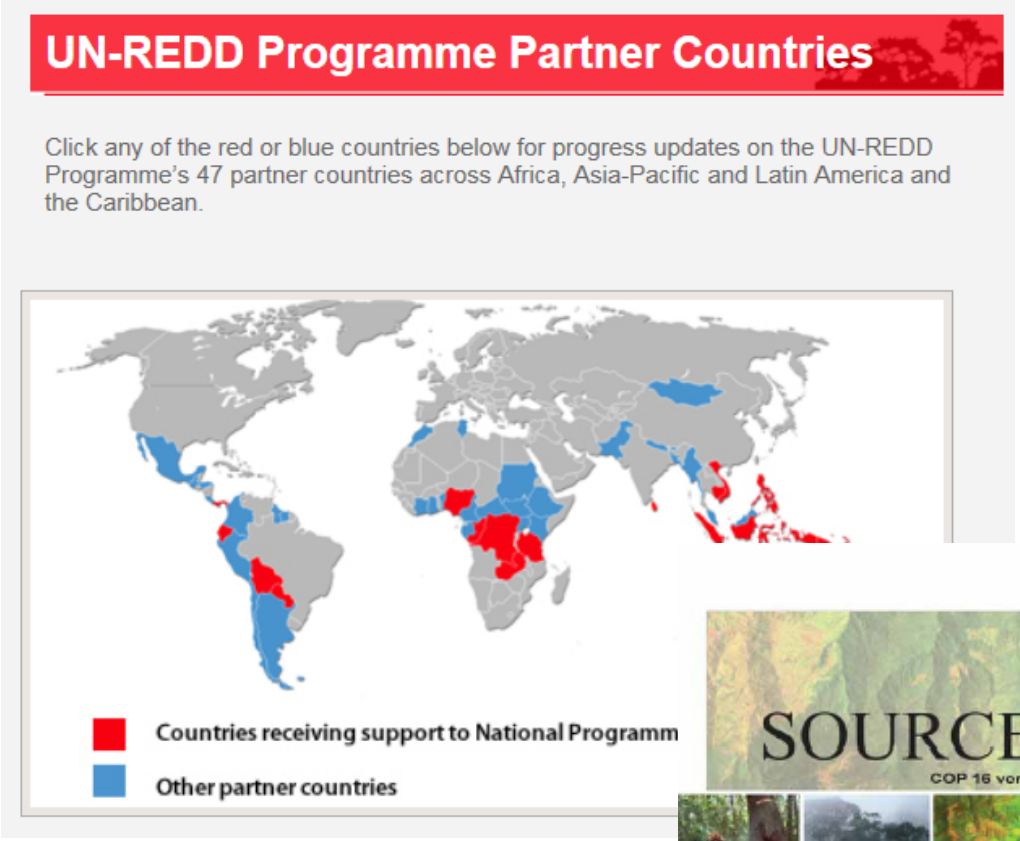
North American Forest Dynamics Vegetation Change Tracker



Lake Anna, VA, 60 km NW of Richmond

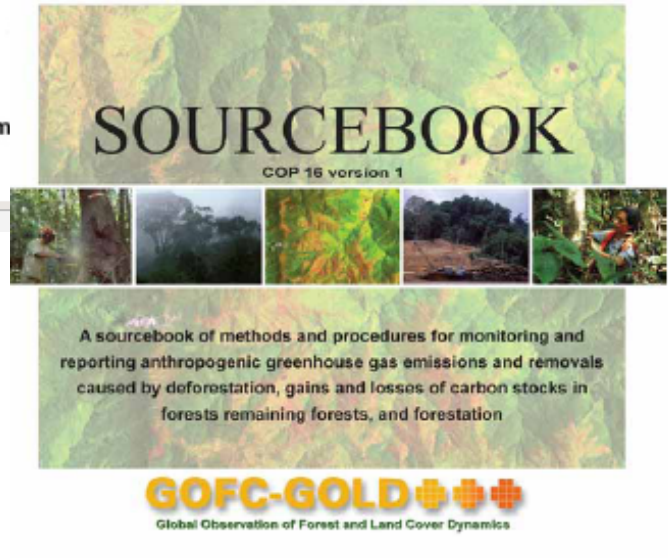
Goward, Huang et al *North American Forest Dynamics (NAFD) - A NACP Core Project*

UN REDD+
Monitoring, Reporting and Verification



UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD)

FAO, UNDP, UNEP
Framework Document
20 June 2008



Expanded Take Home Message

- Satellite-based monitoring can provide policy relevant information for societal benefit
- Consistent long-term data records (CDR's) are as important for several applications of societal benefit as they are for global change research
- Because its 'operational' doesn't mean we can tolerate poorer quality data (Data Quality Matters)
- Science stewardship of the data is required for both science and applications - involving calibration, quality assessment and use
- Frequent reprocessing of the data records is implicit in the development of consistent long-term data records (as the data are better understood)
- Should the NOAA CDR Program include land applications of 'societal benefit'? – If so - what changes to the program would be needed?